CIRM Major Research Facilities Grant
Applicant Information & Signature Form

FA1-00617-1

Applicant Information

Applicant Organization	University of California, Santa Cruz		
Application Number	FA1-00617-1	Enter the application number you received via email from CIRM (for example "FA1-99999-1", where "9" represents any digit).	
Facilities Contact	Julian Halkett	Email	halkett@ucsc.edu
Title	Project Manager	Telephone	(831) 459-4237

Authorized Executive Officer* (e.g., Provost, CEO)

Name	Prefix	First: Meredith	Middle	Last: Michaels	Suffix

Degree	M.A.	Choose the highest degree earned. If your degree is not listed, enter it in the drop-down box.	
Position Title	Vice Chancellor, Planning and Budget		e.g., Provost, CEO
Address	Office of Planning and Budget		Please provide a complete mailing address to which confidential information about your application may be sent.
	3rd Floor, Kerr Hall, UCSC		
	1156 High Street		
City	Santa Cruz	CA	Zip Code 95064
Phone Number	(831) 459-4317	Ext	Fax Number (831) 459-2098
Email (required)	Meredith.Michaels@ADM.UCSC.edu	This email address identifies you to CIRM. Please use this email address for all correspondence with CIRM.	

***Authorized Executive Officer** - a senior organizational official who has the authority, **or who has been delegated the authority**, to commit funds for major facilities on behalf of the organization and who has the authority, **or who has been delegated the authority**, to commit the organization's resources to realize their strategic stem cell research program.

CIRM Category of Stem Cell Research Program

Please select the appropriate entry below to indicate the category for which you are competing in your application.

- ○ CIRM Institute (CIRM award of up to $50 million)
- ○ CIRM Center of Excellence (CIRM award of up to $25 million)
- ◉ CIRM Special Program (CIRM award of up to $10 million)

CIRM Funds Requested

CIRM Funds Requested	$ 8,665,000
Matching Funds @ 20%	$ 1,733,000
Leverage Funds	$ 2,498,500
Total	**$12,896,500**

Signature

Authorized Executive Officer Meredith Michaels

I, the Authorized Executive Officer for the applicant organization, certify that the information presented in this application is true and correct.

Meredith Michaels — 2/25/08

Signature: Authorized Executive Officer — Date

1 Executive Summary

The University of California Santa Cruz proposes the construction of a state-of-the-art, urgently needed stem cell research facility for UCSC's Institute for the Biology of Stem Cells (IBSC), to be housed within a new state-funded biomedical research building to begin construction in January 2009. We are requesting $8,665,000 of CIRM Major Facilities funding from the Special Programs category. The proposed IBSC facility will occupy the 4th floor of the interdisciplinary Biomedical Sciences Facility and a portion of the basement vivarium, and is designed to accommodate six stem cell faculty and to support all IBSC affiliates through the establishment of several core facilities required for laboratories performing stem cell research. The core facilities will include tissue culture rooms, cytometry, microscopy, electrophysiology, and high throughput sequencing. In addition, a new vivarium will include a suite of rooms associated with the IBSC facility for gene targeting, embryo manipulation, surgery, and xenograft procedures, bringing the total new institute space to 13,079 asf.

The IBSC is an interdisciplinary program involving faculty from 5 UCSC departments and numerous collaborators at Stanford University and elsewhere. The program involves faculty from 3 departments in the Division of Physical and Biological Sciences (PBS) - Molecular, Cell and Development Biology (MCD), Environmental Toxicology (ETOX), and Astronomy and Astrophysics (ASTR), and 2 departments from the Baskin School of Engineering (BSOE) - Biomolecular Engineering (BME) and Electrical Engineering (EE). Focused on basic and discovery research (Element X), the IBSC builds on the unique strengths of a diverse group of researchers with expertise in bioinformatics and genomics, chromatin and RNA regulation, development, and new engineering technologies.

UCSC has developed outstanding research and training programs in stem cell biology. In 2006 we initiated a CIRM-funded Training Program in Systems Biology of Stem Cells for graduate students and postdoctoral researchers, offering courses in the biology of stem cells and ethical issues in stem cell research, and a laboratory course on the manipulation of stem cells. Construction of a CIRM-funded Shared Stem Cell Facility (SSCF) will be completed in two months (April 2008), significantly expanding our training capacity. Fifteen faculty with diverse expertise and interests are carrying out stem cell research, 7 of whom were hired in the past 2 years, and three others are working on technology development (comprising the 18 IBSC faculty). Two of our faculty have been awarded CIRM SEED grants, and 2 others have been awarded CIRM New Investigator Awards. Thus, UCSC has an active and growing stem cell research program.

Current space limits the IBSC to only one additional faculty hire in stem cell research, and space and resources for existing faculty are also limiting. The CIRM-funded Shared Stem Cell Facility will represent UCSC's only core stem cell facility and only shared NIH funding-free space available to IBSC faculty until the proposed CIRM Major Facility is built. The SSCF will provide urgently needed core facility space - including two cell culture rooms (one dedicated primarily to training), microscopy, FACS, and sample preparation and analysis rooms - but will not include individual investigator labs and will not increase our ability to hire new faculty. The goals of this CIRM Special Program are to:

(1) Create more investigator laboratory space to enable the hiring of additional faculty in stem cell research, and to relocate certain existing faculty into optimal space in the new facility;

(2) Build the key core facilities required for UCSC investigators;

(3) Build upon UCSC's existing strengths in several specialized areas that have the most promise for the field of stem cell research; and

(4) Create a hub where stem cell research is the focus, where interactions between stem cell labs are facilitated, and where stem cell investigators from other floors and other buildings convene.

Value

The proposed IBSC facility represents and exceptional value for taxpayer dollars. Due to fortunate timing, we are able to take advantage of an existing building project in which much of the standard costs of new construction are already covered by the base construction budget. CIRM funds are only needed to upgrade shell space to fully-outfitted labs and facilities. This option was also the most attractive because the Biomedical Sciences Facility is an ideal location to accommodate the IBSC. UCSC stem cell faculty concentrated on the 4th floor will be clustered with other biomedical researchers on the other 3 laboratory floors of the building, and the building is sited in the middle of Science Hill, in close proximity to other IBSC researchers in related disciplines. Construction costs for this project are more attractive than a renovation project that the campus could consider, and are only those costs that are necessary and reasonable. Furthermore, the UCSC is intent on making the Biomedical Sciences Facility a showcase of innovative technology, sustainability, and efficiency. We anticipate that the building will obtain a LEED score of at least 38 points, placing it at the top of the "Silver" category. We have implemented numerous innovation elements into the building design and operation – e.g. an induction diffuser cooling system, renewable energy (the UCSC campus purchases 100% renewable energy), healthy housekeeping – and are working closely with partners Labs21 and Savings By Design to maximize sustainability.

Leverage

UCSC has committed to $2,940,500 in capital equipment required for the function of the proposed facility. Of that total, $442,000 is considered match, and the balance of $2,498,500 is considered leverage. Our "leverage to CIRM request" ratio is therefore 0.29. Our "total campus funds (match plus leverage) to CIRM funds" ratio is 0.49.

Urgency

The campus and University have considered the Biomedical Sciences Facility an urgent project since its inception and adopted an accelerated schedule that lead to the pre-funding of preliminary plans, schematic design and cost estimates. We are planning for a project start date of January 2009 and beneficial occupancy and equipment installation by December of 2010.

Shared Resources

The proposed project maximizes sharing of facilities, equipment and personnel by concentrating researchers with common interests and resource requirements into a common location, allowing a highly efficient use of common/shared resources and space. Furthermore, the location of this facility within the Biomedical Sciences Facility enables IBSC faculty to take advantage of other

key resources provided in the building. The IBSC facility will also allow an optimal division of function between the two sites of stem cell work - the IBSC floor will primarily serve the needs of stem cell-focused faculty in the Biomedical Sciences Facility, while the core cell culture room in the SSCF in Sinsheimer Labs will be used by stem cell researchers in that building, and the training facility In the SSCF will continue to serve faculty, students and postdoctoral researchers. The two sites of stem cell research will have certain facilities in common in addition to cell culture, such as microscopy and cytometry. These facilities will be managed as operated as single units in order to avoid unnecessary costs that might be associated with operating similar facilities.

Functionality

The proposed IBSC facility is designed with an intelligent mix of flexible, generic use research labs and support spaces with customized core facilities chosen specifically for the research foci of UCSC IBSC faculty. Core cell culture, cytometry, microscopy, electrophysiology, sequencing, and vivarium facilities will provide new capabilities and higher capacity to UCSC investigators, facilitating ground-breaking advances in stem cell research and allowing our vibrant program to grow and reach critical mass. Thus, the planned IBSC facility will rapidly transform stem cell and regenerative medicine research at UCSC.

Section 2. Mandatory Requirements

2A Nonprofit Status

UCSC is an academic institution and therefore is considered neither a non-profit nor for-profit entity.

2B Private Business Use

No private, for-profit, or income-generating business is planned to occur within the facility.

2C Prevailing Wage Requirement

UCSC has reviewed the Grant Administration Policy Exhibit A Facilities GAP Statement of Assurances Relating to State Prevailing Wage Compliance, and will comply with the California State Prevailing Wage Requirement.

2D Use of California Suppliers

UCSC will make a good faith effort to achieve the goal of purchasing more than 50 percent of goods and services from California suppliers. The majority of the project consultants and project contractors are based in California. Of the 15 consultants, only three (lighting, specifications, and wind tunnel testing) were from outside California. All 69 of the prequalified subcontractors are based in California. The contract specifications will include wording to encourage preference for California suppliers, equipment, and products in accordance with Proposition 71. At the conclusion of the project, a final report will be developed from contract award documents and approved construction submittals indicating the participation achieved on the project.

Section 3. Program & Project Description

3A Program Objectives

Overview of Research Program

The UCSC Institute for the Biology of Stem Cells (IBSC) is an interdisciplinary program involving faculty from 5 UCSC departments and numerous collaborators at Stanford University and elsewhere. The program involves faculty from 3 departments in the Division of Physical and Biological Sciences (PBS) - Molecular, Cell and Developmental Biology (MCD), Environmental Toxicology (ETOX), and Astronomy and Astrophysics (ASTR), and 2 departments from the Baskin School of Engineering (BSOE) - Biomolecular Engineering (BME) and Electrical Engineering (EE). Currently focused on basic and discovery research (Element X), the IBSC builds on the unique strengths of a diverse group of researchers with expertise in bioinformatics and genomics, chromatin and RNA regulation, development, and new engineering technologies. A CIRM-funded IBSC facility for human stem cell biology will provide space and facilities for 3 existing research labs working with human embryonic stem cells as well as for 3 new hires. More than doubling our existing NIH funding-free stem cell space, the facility will bring together stem cell investigators, co-locate them with necessary core facilities, and serve as a hub for stem cell research on the UCSC campus. The close proximity between bioinformatics and "wet" stem cell labs afforded by the proposed space will speed advances made by both types of research. The increased laboratory capacity will also allow investigators developing new technologies, such as our collaborators in adaptive optics and niche fabrication, to work side by side with stem cell biologists. A dedicated IBSC facility is urgently needed to allow UCSC to reach a critical mass in stem cell faculty. UCSC has made tremendous progress in the past 3 years in establishing a strong and vibrant stem cell research program. A few more key hires, including recruitment of an established and internationally recognized stem cell researcher to help lead our efforts, would ensure the success of our program. The proposed IBSC facility will greatly assist our recruitment efforts, ensure the continued growth and vitality of stem cell research at UCSC, and enable UCSC to better contribute to CIRM-funded efforts statewide.

The UCSC Institute for the Biology of Stem Cells (IBSC)

UCSC has developed outstanding research and training programs in stem cell biology. In 2006 we initiated a CIRM-funded Training Program in Systems Biology of Stem Cells for graduate students and postdoctoral researchers, offering courses in the biology of stem cells and ethical issues in stem cell research, and a laboratory course on the manipulation of stem cells. Construction of a CIRM-funded Shared Stem Cell Facility (SSCF) will be completed in two months (April 2008), significantly expanding our training capacity. Fifteen faculty with diverse expertise and interests are carrying out stem cell research, 7 of whom were hired in the past 2 years, and three others are working on technology development (comprising the 18 IBSC faculty). Two of our faculty have been awarded CIRM SEED grants, and 2 others have been awarded CIRM New Investigator Awards. Thus, UCSC has an active and growing stem cell research program. Faculty expertise can be divided into five areas:

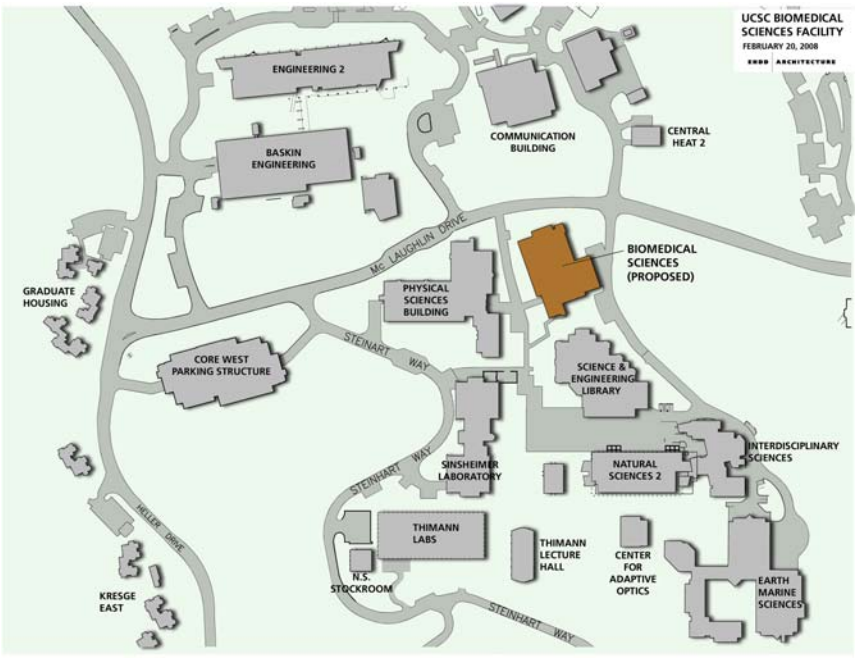
- <u>Bioinformatics and Genomics (David Haussler, Jim Kent, and Joshua Stuart, all from BME):</u> Our bioinformatics group, which produces the widely used UCSC Genome Browser, is developing novel computational methods to integrate and analyze the large data sets that are being generated by genomic approaches to stem cell biology. This group will play an essential role in the analysis and representation of data generated by CIRM-funded labs and beyond. One exciting focus of investigation is newly identified, highly conserved, and rapidly evolving genomic regions that are now being studied in the context of stem cell gene regulation.

- Chromatin Regulation and Epigenetics (Rohinton Kamakaka, Susan Strome, and John Tamkun, all from MCD): The developmental programs of stem cells are driven by changes in gene expression. UCSC has an outstanding group of chromosome biologists who study epigenetic mechanisms that regulate gene expression. The discoveries made by this group are likely to lead to new approaches to maintaining pluripotency and controlling the differentiation of stem cells.
- RNA Regulation (Manny Ares - MCD, David Haussler - BME): Gene expression in stem cells is also regulated at the level of RNA. Our stem cell research program includes members of the UCSC RNA Center, a world-class group of interdisciplinary researchers focused on the structure and function of RNA. These researchers are studying the mechanisms by which RNA regulates pluripotency and differentiation of stem cells.
- Development (Manel Camps - ETOX, Bin Chen - MCD, Camilla Forsberg - BME, David Feldheim - MCD, and Yi Zuo - MCD): Four recent hires have bolstered our team of vertebrate developmental biologists studying the processes that lead to cellular differentiation and tissue formation, such as the mechanisms underlying differentiation of neuronal and hematopoietic stem cells. Three of these investigators have CIRM support in the form of a SEED grant (Feldheim, Chen) or a New Investigator Award (Chen and Forsberg, the latter in collaboration with bioinformaticist Josh Stuart).
- New Technologies (Don Gavel - ASTR, Mike Isaacson - EE, Joel Kubby - EE, Nader Pourmand - BME, Bill Sullivan - MCD): Innovative faculty from UCSC's Baskin School of Engineering and our world class Astronomy Department working in conjunction with faculty from Molecular, Cell and Developmental Biology (MCD) are developing new technologies to help overcome the unique technical challenges associated with stem cell biology. These include single cell sequencing, adaptive optics for deep tissue imaging, and synthetic niche fabrication.

IBSC investigators are highly interactive across disciplines and are joined by common goals, integrated graduate programs, and stem cell-specific activities and programs, such as the stem cell training program, seminars and journal club. With the construction of the proposed IBSC facility, they will also be joined by state-of-the-art research space.

A new CIRM-funded facility for stem cell research

We are seeking funding for a new stem cell research facility that is essential for the future growth and vitality of our program. A new State-funded 63,000 assignable square foot (asf) Biomedical Sciences Facility is scheduled for construction beginning in January 2009. This building will provide urgently needed space for growth of biomedical research on campus. As has been the model for other science buildings on campus, the new building will accommodate researchers from multiple departments and



disciplines to create a highly interactive and interdisciplinary research environment. It will be located in the midst of a cluster of science buildings that house existing stem cell research labs (see map).

We propose dedicating the fourth floor of the new building to the IBSC. The floor has been designed to accommodate 6 stem cell labs, essential shared core facilities, support space, offices, and a conference room. The shared core facilities will include 2 tissue culture rooms, flow cytometry, microscopy, electrophysiology, and high-throughput sequencing. In addition, a vivarium located in the basement will include a suite of rooms dedicated to the IBSC for gene targeting, embryo manipulation, ultrasound biomicroscopy, stereotaxic surgery and xenograft procedures, bringing the total new institute space to 13,100 sf. Three current faculty will move their labs to the facility (MCD faculty Chen and Feldheim and BME faculty member Forsberg), and 3 newly hired stem cell faculty will set up their labs there (again the hires will be split between BME and MCD). In addition to the 6 stem cell "wet" labs, shared usage workspaces will be available to members of bioinformatics laboratories, to provide proximity and daily interaction between wet and dry lab research groups. The IBSC floor is designed to support powerful, state-of-the-art approaches to culturing, manipulating, imaging and analyzing stem cells, to foster interaction and cross-fertilization between members from diverse disciplines, and to serve as a gathering site for stem cell researchers from across campus.

Benefits to stem cell research at UCSC

- A centralized and dedicated stem cell floor in the new Biomedical Sciences Facility will concentrate researchers whose primary focus is cultured human and mouse stem cells into a common, well supported facility. This concentration will promote scientific exchange, maximize effective use of shared equipment, support personnel, and space, and allow faster progress towards translational research.

- The IBSC floor is ideally situated to serve as a hub for stem cell research across the UCSC campus. Within a 3-minute walk from the new building are the 5 buildings in which other stem cell investigators are housed - Baskin Engineering, Engineering 2, Sinsheimer Labs, Physical Sciences, and the Center for Adaptive Optics. To promote exchange, collaboration, and interdisciplinary investigations, all of these "Science Hill" buildings house a mix of faculty from different departments and disciplines. To promote synergistic advances in key areas, investigators with a common focus are clustered, e.g. RNA investigators from MCD Biology, BME and Chemistry are co-located in Sinsheimer labs as are neuroscientists from MCD Biology and Physics. Mammalian stem cells will have a focus area on the IBSC floor of the Biomedical Sciences Facility. The confluence of mammalian stem cell investigators, critical core facilities, and a dedicated conference room will greatly increase opportunities for stem cell investigators housed in different buildings to meet and interact.

- A strong, vibrant, and growing stem cell presence at UCSC and the availability of state-of-the-art space and facilities are critical to our faculty recruitment efforts. In the near future, we aim to recruit 3-4 new stem cell investigators, including an established, world-class faculty member to help lead the IBSC. Beyond that, we anticipate that a significant fraction of future biomedical hires will have a stem cell connection or focus. Successful recruiting will hinge on our being competitive in terms of colleagues, space, facilities, and projected future growth. The dedicated IBSC space will significantly increase our competitiveness in all of those areas.

- The proposed project will more than double the campus' NIH-free stem cell facilities, allowing us to more easily operate without restrictions imposed by federal regulations. It will also allow an optimal division of function between our two sites of stem cell work. The core culture room in the CIRM Shared Stem Cell Facility in Sinsheimer Labs will continue to serve stem cell researchers housed in Sinsheimer; the teaching lab in the SSCF will continue to be used for training investigators and students new to stem cells and assisting them with pilot, short-term, and small-scale experiments. The IBSC floor will primarily serve the more intensive needs of the stem cell-focused faculty in the Biomedical Sciences Facility.

- The growth of stem cell research at UCSC enabled by this project will strengthen our ability to recruit graduate students, postdocs, and undergraduates, and will increase the training opportunities available to them. This will lead to a more competitive CIRM Training Program in Systems Biology of Stem Cells, which currently supports 3 graduate students and 3 postdocs. In addition, at least 8 MCD Biology undergraduate majors and 1 Bioinformatics undergraduate are currently performing stem cell research. Starting this spring, the stem cell laboratory course offered in conjunction with our CIRM Training Program will begin accepting advanced undergraduates as space allows. With the additional faculty mentors and research capacity proposed, we will be able to attract and train even more students and postdocs. This increase in trainees will translate into expansion of program activities, including research seminars, a journal club, and an annual off-campus retreat with 1-2 invited outside speakers. These activities, which promote exchange among students and postdocs and allow them to meet and interact with leaders in the field, are an important component of training.

Changes in research program capabilities and capacity that will be achieved as a result of the project

- Space is at a premium on the UCSC campus. Building and equipping 6 new labs dedicated to stem cell research will ensure that the IBSC has a strong foothold among UCSC programs and that UCSC has critical mass in stem cell biology. The expansion of our stem cell programs, together with the additional space and improved facilities proposed, will make it much easier for us to recruit a prominent stem cell researcher to UCSC, which is one of the highest priorities for both the Division of Physical and Biological Sciences and the School of Engineering. The creation of the institute will also free up space for additional hires in biomedical research. Those additional hires, along with hires into the remaining 3 floors of the Biomedical Sciences Facility, will significantly enrich the scientific atmosphere and critical mass of biomedical research at UCSC.

- The expansion of “wet lab” stem cell research is very important to our bioinformatics efforts, which are aimed at developing novel computational approaches to integrating and analyzing stem cell data and building computational models of stem cell behavior. The IBSC will foster direct interactions between computational and experimental researchers, ensuring that our computational efforts generate meaningful data and useful tools for advancing stem cell biology.

- Conversely, wet lab stem cell research at the genomic level can now be performed in the context of the broad web of information that is provided by bioinformatics tools, analyses and databases. Bioinformatics analyses help shape the biological questions being asked and inform the design of wet lab experiments. The collaboration between Assistant Professors Forsberg (a wet lab stem cell biologist) and Stuart (a bioinformaticist/systems biologist) to test models of hematopoietic cell fate decisions is a

good example. Dr. Forsberg's lab will collect high-throughput measurements on purified cell populations which will be analyzed in collaboration with Dr. Stuart's computational lab, taking into consideration multiple functional genomics datasets to identify key regulatory pathways involved in hematopoiesis. This comprehensive view of hematopoiesis will allow a data-driven investigation of how these cell populations relate to one another. Currently, the computational and experimental groups are located in separate buildings. The proposed new facility will provide workspace for postdoctoral fellows and graduate students that Drs. Forsberg and Stuart co-advise. These scholars will be able to interact with investigators from both disciplines on a daily basis, promoting a deep interdisciplinary connection between their experimental and computational labs.

- New technology doesn't develop in a vacuum. UCSC engineers, astronomers and biologists are working together to develop a better microscope, a device to achieve single cell sequence analysis, and a stem cell niche on a chip for mass harvesting of cells. The newly proposed institute and facilities will provide an ideal site for these projects. While using the core facilities and shared office space, engineers and astronomers will work side-by-side with stem cell biologists, facilitating interactions and ensuring the technologies are developed in the context of the practical realities of working with stem cells. UCSC has an outstanding tradition of working across disciplines and departments, and the need for common space is critical. For example, for the development of adaptive optics and artificial niche technologies, it is critical to have immediate access to healthy populations of stem cells and embryoid bodies. Transporting samples from one building to another adds unacceptable time delays and variables. In the proposed CIRM Special Program, core facilities and stem cell expertise will be available to investigators involved in technology development. We envision faculty, students and postdocs rotating in and out of this space as projects mature and new projects come on board.

Cross-divisional joint leadership of the IBSC

Another significant change reinforced by this proposal is the formation of a new leadership model in which two senior faculty from different divisions (BSOE and PBS) join forces to establish the IBSC as founding directors. **Dr. David Haussler**, known for his accomplishments in representing and analyzing the human genome, is increasingly focusing his efforts on bioinformatics approaches to problems in stem cell biology, and will serve as Director. **Dr. Susan Strome**, an established developmental biologist who studies the immortality and totipotency of germ cells was recently recruited to UCSC and will serve as Associate Director. Together they represent two of UCSC's strongest researchers in areas of investigation that are highly complementary. As mentioned earlier, over the longer term we plan to hire an established and internationally known stem cell biologist who will take over in leading the IBSC.

Finally, the growth that the proposed facility will enable has allowed us to engage a stellar group of stem cell faculty to serve as an External Advisory Board. Members include **Dr. Irving Weismann**, Director of the Stanford Institute for Stem Cell Biology and Regenerative Medicine; **Dr. Michael Longaker**, Director of the Stanford Program in Regenerative Medicine; **Dr. Roeland Nusse**, Director of the Stem Cell Research Committee and Chair of Developmental Biology; **Dr. Theo Palmer**, Director of the Stem Cell Research Oversight Committee; Dr. **Renee Reijo Pera**, Director of the Center for Human Embryonic Stem Cell Research and Education (all from Stanford University); and **Dr. Leonard Zon**, Director of the Stem Cell Research Program at Children's Hospital in Boston. During the facility design process, we consulted with Board members or their associates on several occasions, and will continue to do so to assess IBSC goals and progress, and to gain advice on ongoing and future efforts and initiatives.

3B Need for the Project

With current space limitations, the IBSC would only be able to make one additional faculty hire in stem cell research. Space and facilities support for existing faculty is also limited. The soon-to-be-completed CIRM Shared Stem Cell Facility in Sinsheimer Labs will alleviate some of the immediate need for key core facilities (cell culture, FACS, microscopy, and other analytical capabilities), but it will not allow our program to grow because it does not add new investigator labs.

The ***primary goals of this CIRM Special Program*** are to:

(1) Create more investigator laboratory space to enable the hiring of additional faculty in stem cell research, and to relocate certain existing faculty into optimal space in the new facility;

(2) Build the key core facilities required for UCSC investigators;

(3) Build upon UCSC's existing strengths in several specialized areas that have the most promise for the field of stem cell research; and

(4) Create a hub where stem cell research is the focus, where interactions between stem cell labs are facilitated, and where stem cell investigators from other floors and other buildings convene.

UCSC's Biomedical Sciences Facility is designed to house a basement-level vivarium and 24 biomedical investigators on four floors of generic wet laboratory space, shared equipment space, and associated offices, meeting and support space. Due to budget limitations, some of these spaces are currently planned as shell space (fourth floor and a portion of the vivarium). This proposed CIRM Major Facilities Grant would finish and further develop the fourth floor investigator labs, offices and support spaces, and a portion of the vivarium, and would convert many of the generic lab support rooms on the fourth floor into customized core facilities needed for the growth and vitality of UCSC's stem cell program.

The specialization of space in the Biomedical Sciences Facility is by far the best option for creating efficient, highly functional stem cell laboratory space and a centralized stem cell "presence" on campus. First, planning for this building began in late 2002 and has therefore benefited from years of consideration and design by a well-rounded committee of campus administrators, faculty, architects and engineers as well as outside architects, engineers and other specialists. Second, the biomedical research theme of the building makes this location ideal for UCSC's stem cell program, with the IBSC faculty benefiting from the co-location of other biomedical research-oriented labs and facilities on the floors below, in particular the vivarium. Third, the location of this building in the heart of Science Hill is within a short walk for all UCSC stem cell faculty (see area schematic in Section 3A).

Alternatives Considered

Other options that were considered included: construction of a new separate building, renovating space in one of the existing buildings in the Science and Engineering area; renovating space in UCSC off-campus property; or forming a Facilities Collaboration with another institution.

New Building. The option of constructing a new, separate building initially seemed attractive because it offered the possibility of bringing together all UCSC stem cell faculty into one space. While this may be a valid goal at certain campuses, it makes less sense at UCSC where the stem cell research program is comprised of bioinformaticists, biologists, engineers and astronomers who require very different building environments to perform their work. It would not be cost efficient to recreate specialized environments (e.g. computer machine rooms, clean rooms, and adaptive optics labs) that already exist in buildings nearby. In addition, a small standalone building would be much more expensive to construct. The costs of site development and the foundation and roof would be required whether the building was one story or five stories, and the cost would not be shared by other floors.

A standalone building would also take much longer to complete, since planning and design have not yet been done, as they have for the *Biomedical Sciences Facility* project. The extended time frame from conception and programming through design, approvals, and construction for a State-funded project, usually several years, renders the option of a new, separate building unworkable for a timely project completion.

This option also did not receive serious consideration because the campus has limited space available for infill projects in the Science and Engineering area, thus requiring construction of multi-story larger buildings to get the most efficient use of those limited sites. The campus would not want to under-utilize a prime site with a relatively small structure. While some sites appropriate for smaller buildings might be identified, they would not provide essential proximity among the campus's researchers.

Renovations On Campus. Remodeling space in an existing building in the Science and Engineering area did not receive serious consideration primarily because there is no space available. If space in an existing building were renovated for stem cell research, the campus would then need to build space for the displaced occupants. In addition, the relatively high cost of renovating existing space, without getting additional space, made the renovation option much less attractive. Extensive remodeling often requires the renovation of whole building mechanical and electrical systems, which can be extremely costly, whereas location in a new facility provides an opportunity to maximize space and utility efficiencies.

Renovations Off Campus. The option of renovating Building C at 2300 Delaware Avenue, Santa Cruz was viable and seriously considered because the building is vacant and has appropriate infrastructure since it was originally designed and operated as a chip manufacturing plant. However, it has the significant drawback of being in a remote location, approximately 2.2 miles from the main campus.

Facilities Collaboration. While the option of forming a Facilities Collaboration or some other type of resource sharing arrangement with another institution may be the best option for certain campuses, UCSC is too physically isolated from other facilities (the closest being Stanford and UCSF) for this to be an effective option. Although individual investigator efforts could be supported in this manner, it would not be conducive to program-building and the training of students and postdocs at UCSC. We feel that our program has much more potential if housed on campus than it would have if we had individual labs commuting to another location.

3C Project Description

Overview of Project

We propose the construction of a stem cell research facility for UCSC's Institute for the Biology of Stem Cells (IBSC), to be housed within a new state-funded biomedical research building. The *Biomedical Sciences Facility*, scheduled to begin construction in January 2009, will create a highly interactive and interdisciplinary research environment while providing urgently needed space for existing and new biomedical researchers from multiple departments within the Physical and Biological Sciences Division and the Baskin School of Engineering. The July 2005 Project Planning Guide outlined the need for approximately 63,000 assignable square feet (asf) of research and office space dedicated to biomedical research. In order to keep on a highly accelerated schedule, the campus and the university pre-funded preliminary plans prior to voter approval of Proposition 1D on the November 7, 2006 ballot. This General Obligation Bond also funds the construction phase of the project.

The proposed IBSC facility will occupy the 4th floor of the Biomedical Sciences Facility and a portion of the basement vivarium, and is designed to house six stem cell faculty and to support all IBSC affiliates through the establishment of several core facilities required for laboratories performing basic and discovery stem cell research (Element X). This space will allow UCSC to hire additional stem cell faculty working on hESCs and will operate without restrictions imposed by federal regulations. Core facilities will include tissue culture rooms, cytometry, microscopy, electrophysiology, and high throughput sequencing. In addition, a new vivarium will include a suite of rooms associated with the IBSC facility for gene targeting, embryo manipulation and xenograft procedures, bringing the total new institute space to 13,100 asf (our original estimate of the same space in our Part 1 application was 13,200 asf). Our current plan is for three existing faculty to occupy the facility along with three newly hired stem cell faculty. An additional new hire and other existing stem cell faculty will be located in the same building, along with other biomedical researchers. CIRM Special Program funding will ensure that the fourth floor and part of the vivarium of the new Biomedical Sciences building is dedicated to stem cell research, thus enabling UCSC's IBSC to grow and further contribute to advances in stem cell research and regenerative medicine.

Project Description

The Biomedical Sciences Facility, with constructions documents currently complete, demonstrates UC Santa Cruz's investment in interdisciplinary biomedical sciences research and teaching, bringing together faculty, students, and staff from multiple departments to promote scientific collaboration, the sharing of specialized facilities, and the integration of instructional and research activities. Members from three departments from the Physical and Biological Sciences Division (Molecular, Cell, and Developmental Biology; Chemistry and Biochemistry; and Environmental Toxicology) and one department from the School of Engineering (Biomolecular Engineering) will occupy the building. The building will allow the Santa Cruz campus to expand its involvement in key areas of biomedical sciences, bridging conventional disciplinary boundaries and expanding programs of excellence in a number of specific areas, including stem cell research.

For this CIRM Special Program, we propose modifying the current design of the Biomedical Sciences Facility to create research labs, vivarium and support space that is specifically customized for stem cell research. This project will assign approximately 13,100 asf of the new

building to stem cell research associated with UCSC's Institute for the Biology of Stem Cells. This includes the entire 4th floor and close to 20% of the vivarium. The campus selected the 4th floor for the investigator labs and core facilities because it is the farthest removed from public spaces, and because proximity to the roof makes it possible to modify the exhaust system should that become necessary in the future. While maintaining the design principles applied to the building as a whole, we have focused on altering the capabilities of shared rooms and the design of core facilities to meet the specific needs of our stem cell research program.

The six investigator labs are designed as "generic use" wet labs for biomedical research, rather than being customized for specific faculty. These labs are comprised of a main laboratory of approximately 750 asf (with 60 linear feet of bench space, desk space for six lab members, floor space for large equipment, and standard wet lab utilities throughout) an adjacent procedure room (~170 asf) and a fume hood room (~175 asf) to be shared with the adjoining investigator lab. Open and continuous lab suites allow for flexibility in assigning research clusters and facilitate interaction among the different groups. A combination of built-in casework and adjustable height bench systems, mobile tables and mobile cabinetry is employed in order to provide a flexible laboratory environment. These labs are located along the southwest, public face of building, maximizing use of natural daylight and views.

A 1:1 ratio of "investigator lab" to "lab support" space is provided. The design team chose this ratio as optimal in terms of functionality and efficiency based on data collected from prior successful lab building projects. Lab support rooms (core facilities, fume hood rooms, equipment vestibules, generic procedure rooms, environmental rooms, and dark rooms) are designed for flexibility as appropriate so that they can accommodate changes in use.

Private offices are located directly across the corridor from the lab support and core facility spaces in order to provide the most direct adjacency to the labs and lab support. Offices are located along the northeast face of the building, with forest views, thereby providing a more contemplative exposure. This zoning also allows for minimizing the areas requiring 100% exhausted air and stringent vibration requirements. Interactive spaces such as scholarly activity areas, meeting rooms, copy rooms and lunch areas are located in order to foster informal interaction and to augment the sharing of ideas in a collaborative environment.

The vivarium, designed in close consultation with Dr. Joseph Spinelli, DVM (retired director of UC San Francisco's Animal Care Facility) is secure, functional and appropriate for the overall building budget. The vivarium will occupy the basement level, with restricted access, in order to provide greater security and meet the need for direct access to a loading dock. The design criteria include a veterinary perspective on the best materials and methods that form the basis of specifications for a high quality laboratory animal facility. All building construction, finishes and detail meet or exceed the standards established by the *Guide for the Care and Use of Laboratory Animals* from the National Research Council.

The core facilities to be established (described below) were chosen for their utility to the IBSC's primary research foci: genomics, chromatin and RNA regulation, development (including neurobiology and hematopoiesis) and technology development. They include cell culture, cytometry and microscopy facilities, a sequencing center, an electrophysiology facility, and specialized vivarium space. All cores will be established upon completion of the building.

Cell Culture. Two rooms will be designated as Biosafety Level 2 (BSL2) culture facilities for growing and manipulating human and mouse stem cells. (In our Part 1 proposal we indicated 3 rooms would be dedicated to cell culture. We have simply removed a wall between two of the rooms to create a larger room.) One of the rooms will be isolated and operated using enhanced

BSL2 procedures to support experimentation using lentiviral vectors and other procedures where increased biosafety practices are prudent. In addition to standard biosafety cabinets, incubators, inverted microscopes and other required equipment, one room will house an in vitro fertilization (IVF) downdraft table outfitted with a fluorescent stereomicroscope. This equipment will be used for the manual dissection of hESC colonies in an aseptic environment and to photograph cellular morphologies of differentiated and undifferentiated hESC lines. The fluorescence capability of this microscope will enable the identification and selection of hESC clones expressing green fluorescent protein (GFP). This facility will be needed by all stem cell researchers housed in the building. These culture rooms will primarily serve the six faculty labs on the floor but will also support other IBSC researchers.

Cytometry. Sample population analysis and cell sorting are standard methods in stem cell research, particularly since differentiation protocols generally produce a mixture of cell types. UCSC recently purchased a fluorescence activated cell sorter (FACS) to be located in the Shared Stem Cell Facility under construction in Sinsheimer Labs, but a second cytometer is required to accommodate the growth of our stem cell program in the new Biomedical Sciences Building. The unit we purchase will be a less expensive model that does not sort cells, but will have the same lasers as the FACS. This instrument will be used to assess donor chimerism of transplanted animals, to test fluorescent reporter genes, to analyze specific ES-derived stem cell populations and to establish conditions for sorting desired cell populations using the sorter in the Shared Stem Cell Facility. For example, cell surface marker expression can be monitored in combination with expression of GFP-reporters to determine how well particular differentiation protocols produce the desired cell types. Based on this analysis, one can set up sorting experiments to isolate a specific population of differentiated cells for further analysis.

Microscopy. Existing microscopes available to IBSC faculty are heavily utilized, and we expect the new microscopy facility will be as well. We are aiming to build a first rate microscopy core specifically designed to meet the demands of imaging stem cells. The facility will include a new generation fluorescent microscope designed for long-term non-invasive automated live imaging of stem cell behavior, such as division and migration, and of the dynamic properties of intracellular components and structures, and a two-photon microscope for deep tissue imaging. In addition, the facility will include a widefield fluorescent microscope for more routine stem cell imaging needs. When combined with electrophysiological analysis (e.g., neuron excitability and channel properties), live cell imaging provides valuable information about how neurons from stem cells integrate and modify existing neural circuitry. We will have the capability to image live cells by phase contrast, differential interference contrast (DIC), and two-photon microscopy. While phase contrast and DIC allow us to directly observe morphological changes in stem cells without staining, the two-photon microscope will enable fluorescently labeled cells and cellular components (e.g., GFP-tagged cytoskeleton proteins) to be monitored over time, with high spatial resolution and minimal photo-damage. Other common imaging applications involve fixing and staining cells, for example with antibodies to markers of pluripotency, differentiation, tissue type, or chromatin state. Fixed and stained cells may be viewed by widefield fluorescence or confocal microscopy. The microscopy facility will be adjacent to the cell culture labs and cell sorting facility, to minimize transport of cells and exposure to variations in growth conditions.

Sequencing Facility. Many IBSC faculty have planned experimental approaches that require high-throughput sequencing, including Chromatin Immunoprecipitation (ChIP) to identify genomic features of interest, gene expression profiling in stem cells during differentiation, RNA processing changes, and RNA-protein complex changes during development. BME's Dr. Pourmand has also planned work to develop technology to reliably amplify DNA or transcripts

from single cells for sequencing. All of these innovative research projects and others will require access to newly developed sequencing technology that is now commercially available (e.g. ABI's SOLiD system). In particular, the ability of this technology to simultaneously sequence millions of pieces of DNA in the same sample enables an array of experimental approaches that were not previously feasible; the projects requiring use of the Sequencing Facility all capitalize on this new technique in sequencing. Our planned Sequencing Facility to house these next-generation instruments for these projects will have two rooms: a clean-room sample preparation space and a machine space for three next-generation sequencers and the associated computing equipment. In addition, the Sequencing Facility will also have the requisite sample preparation systems for physical cloning of DNA molecules followed by a highly-parallel process of PCR amplification and sequencing using universal DNA adaptors.

Electrophysiology Facility. The electrophysiology facility will support IBSC stem cell neurobiologists by providing equipment to record from both cultured neurons and acute brain slices. Electrophysiology studies provide a functional readout of stem-cell derived neurons, which is essential for determining their true identity. For example, this facility will allow Dr Zuo to study the property of stem cell-derived neurons in the post-stroke brain. This will reveal how newly added neurons incorporate into the pre-existing neural network, adding essential functional information to complement the *in vivo* imaging she performs. A better understanding of both structural and functional characteristics of stem-cell derived neurons during post-stroke behavior recovery will assist in designing more effective therapy protocols. Dr. Chen's goal of generating corticospinal motor neurons from hESCs, and Dr. Feldheim's goal of purifying specific subsets of neurons based on Eph/ephrin expression will also benefit from this facility. This room will have the capacity to house 2 electrophysiology "rigs" consisting of a rack of instruments, a microscope, and other accessories to analyze the electrophysiological properties of stem cell-derived neurons and tissues.

Vivarium/Transgenic Mouse Facility. In 2006 the campus established a transgenic core facility with the necessary equipment and experienced staff to enable the generation and preservation of transgenic mouse models and targeted mutants. The relocation of this facility to the more expansive and modern vivarium in the Biomedical Sciences Facility will provide more capacity and suitable space for experiments testing hESC derivatives in mouse models. The following spaces within the vivarium will be dedicated to stem cell research:

-- Micro-injection/Assisted Reproduction Technology (ART) suites. These areas will be used to produce transgenic mice, targeted mutants, chimeras, and all support materials (i.e. mouse embryonic fibroblasts) for hESC culture. The secondary task for this area is amplification and preservation of murine research models (IVF, ICSI & cryopreservation) to facilitate production and archive valuable animal models. There will also be a teaching component associated with this room including somatic cell nuclear transfer (SCNT), delayed blastocysts/ ES cell line production and MEF production.

-- ART Animal Holding room. This will be the primary support area for the micro-injection and ART (assisted reproductive technology) suites. This room will have strict entry and exit guidelines and is the center of where animals are produced for IBSC researchers; it is therefore separated from other holding rooms to reduce the potential for contamination.

-- Long Term Storage and Breeding. As the primary long term storage and breeding room for experiments involving human/mouse chimeras, this room will separate chimeras from the main colonies to prevent loss of work through contamination. Ventilated micro-isolated caging will be

utilized to minimize pathogenic contamination and to prevent overloading of the HVAC due to colony density (primarily heat, moisture and ammonia production.)

-- Procedure and Temporary Holding rooms. These rooms will be used for animals that are involved in transplantation of stem and progenitor cells, as well as surgical procedures. Current approaches include intravenous transplantation of hematopoietic stem and progenitor cells, stereotaxic injection of stem cell-derived neurons, DNA, viruses, neuronal tracers, or drugs into the brains of adult mice, and image-guided injection of these materials by ultrasound biomicroscopy into the brains of developing mouse embryos in utero. These procedures will assist studying the mechanisms of hematopoietic and neural stem cell lineage and fate specification, and testing and studying the integration of stem cell-derived neurons into a functional brain circuit after transplantation. After surgery, the animals will remain in this room to minimize potential disruption or contamination caused by reintroducing them into the long term storage rooms. This area will also house a self-shielded X-ray irradiator for conditioning of mice prior to stem cell transplantation, and for irradiation of feeder cells, animal food and other specimens.

In addition to the core facilities listed above, this project will create:

- 2 small *darkrooms* - one for developing film; the other for developing *in situ* slides for radioactive in situ hybridization and other procedures. Separating these two functions into separate rooms allows several investigators to work simultaneously without jeopardizing each other's work;
- an *autoclave* room – for sterilization of glassware, certain plasticware and solutions;
- a *warm room* – for growing small and large scale bacterial cultures used to generate recombinant DNA;
- a *cold room* - for biochemical and molecular biology procedures requiring cold as well as for storage of reagents, bacterial plates, etc;
- 3 *equipment vestibules* for storage of large shared equipment and gas cylinders to supply the cell culture rooms;
- a *conference room;*
- *office space* for faculty, staff, postdocs and collaborators from other buildings (e.g. researchers in bioinformaticists, niche fabrication engineers, and optics researchers);
- an *interactive/break* room; and
- an *office service* room

Space Allocation

The amount of space allocated to each general functional category (investigator lab, support space, offices, vivarium, etc) was determined by a committee consisting of faculty, research and animal care staff, campus architects and engineers, capital planning personnel, student representatives, and the architectural firm. Because of the limited footprint of the building, space allocation is very efficient, and represents an economical solution for the intended uses. Rather than the traditional approach of including fume hoods and other major equipment in the labs themselves and separating all labs from each other by walls, an open lab concept was used. Small dedicated fume hood rooms are immediately adjacent to the labs and are each shared by two PIs. This allowed a lower number of air changes in the open lab area and will save both construction costs and ongoing energy costs. Circulation is through the open labs and equipment vestibules that are wide enough to store large pieces of equipment on either side of the access route. As a result of this design approach, an exceptionally high efficiency ratio for a lab building (63%) was achieved.

The 13,100 assignable square feet (asf) of stem cell space associated with this Major Facility proposal will more than double UCSC's current NIH funding-free research space. Approximately 4,500 asf will be designated as individual faculty laboratory space, almost 2,700 asf for common space (warm, cold and dark rooms, equipment rooms, etc), over 3,800 asf for core services, 1,400 asf for PI, postdoctoral, staff and flexible use offices, and 700 asf for administrative space (office service, conference and interactive space). No administrative offices are planned for the IBSC floor – administrative support will be provided by existing departmental offices and the Center for Biomolecular Science and Engineering. A detailed table of space categories and square footage is shown in Section 8C.

There are no special requirements for the building utilities, site development, or other characteristics that impact the budget of the Biomedical Sciences Facility. The site chosen for the building is on an existing parking lot that is relatively flat and close to existing utilities, minimizing the costs of site work and extending utilities. In addition, this CIRM project, because it is the completion and customization of shell space, is not burdened by any of the site development costs or by the cost of the foundation, exterior walls, roof, vertical circulation, or vertical utility distribution. The environmental review presented to The Regents in January 2007 did not identify any project elements needed to mitigate environmental impacts (see section 7B for further information on status of environmental review).

The proposed IBSC facility will enable new projects that integrate the expertise of several strong research groups at UCSC focusing on problems in stem cell biology, and will facilitate the collaborative work of many of our faculty with colleagues at Stanford and other institutions. Molecular, cell and developmental biologists will join forces with bioinformaticists, engineers, and even astronomers to perform basic and discovery research that will contribute to the foundation of knowledge necessary for important advances in stem cell-based medicine. The proposed facility will position UCSC faculty to make significant headway in several keys areas of stem cell research, with a number of projects holding promise for eventual pre-clinical studies.

Future Program Expansion

This CIRM Special Program will allow UCSC to expand its research program with new faculty, staff and capabilities. The net result of this new facility will be the ability to hire 4 new faculty, 3 of whom will occupy the proposed 4th floor IBSC space, joining 3 current faculty who will move from existing space. The 4th hire will be located with other stem cell and biomedical research colleagues nearby in the building. As mentioned elsewhere, the Molecular, Cell and Developmental Biology Department has formed one of the top epigenetics groups in the country, and with additional stem cell space and resources hopes to recruit a senior leader to the IBSC in the field of epigenetic regulation of stem cells. The Biomolecular Engineering Department, which houses UCSC's world-class bioinformatics group, plans to make a complementary hire in the area of stem cell genomics - a scientist who blends bioinformatics with genome-wide experimental approaches to understand stem cell function. Both departments plan to make one additional stem cell hire each, with MCD focusing on human cell or developmental biology, and BME focusing on a potential senior hire in stem cell bioengineering.

These hires represent the current growth plan for stem cell research at UCSC. It is possible that additional stem cell faculty will be hired, depending on the needs of the departments and available space and resources. If this happens, faculty working with mouse and human stem cells would be located in the new Biomedical Sciences Facility and faculty working in other

model organisms (e.g. flies or worms) would be located in space in Sinsheimer labs as it becomes available.

3D Space Layout

Current space limits the IBSC to only one additional faculty hire in stem cell research, and space and resources for existing faculty are also limiting. The CIRM-funded 2,000 asf Shared Stem Cell Facility (SSCF) in Sinsheimer Labs, to be completed in April of 2008, will represent UCSC's only core stem cell facility and only shared NIH funding-free space available to IBSC faculty until the proposed CIRM Major Facility is built. The SSCF will provide urgently needed core facility space - including two cell culture rooms (one dedicated primarily to training), microscopy, FACS, and sample preparation and analysis rooms - but will not include individual investigator labs and will not increase our ability to hire new faculty.

This space shortage is being addressed by UCSC's new Biomedical Sciences Facility, which will provide interdisciplinary wet laboratory space and core specialized facilities for scientists concentrating on health and medical issues from the Departments of Molecular, Cell and Developmental Biology (MCD), Chemistry and Biochemistry, Environmental Toxicology and Biomolecular Engineering (BME). The approximately 96,000 gross square foot (gsf) building will consist of four floors of laboratory, office and administrative functions over a basement level vivarium. This translates to 60,000 assignable square feet (asf) comprised of:

36,600 asf of research and laboratory support
12,900 asf vivarium
1,900 asf scholarly activity (meeting rooms, interactive spaces)
8,600 asf academic and administrative offices and office support

A CIRM Major Facilities Special Program award will allow us to assign approximately 13,100 asf of the new building to stem cell research associated with UCSC's Institute for the Biology of Stem Cells. This includes the entire 4th floor and close to 20% of the vivarium. The types of spaces to be constructed are described in detail in Section 3C "Project Description." This project will allow UCSC to expand its stem cell research program with new faculty, new capacity, and new capabilities.

In terms of faculty, the net result will be the ability to hire 4 new faculty, 3 of whom will occupy the proposed 4th floor IBSC space, joining 3 current faculty who will move from existing space (Assistant Professor Chen, Associate Professor Feldheim, both from MCD Biology, and Assistant Professor Forsberg from BME). The 4th hire will be located with other stem cell and biomedical research colleagues nearby in the building. As mentioned elsewhere, the Molecular, Cell and Developmental Biology Department is building one of the top epigenetics groups in the country, and already has a well-established and highly accomplished research program in RNA biology. The proposed augmentation of stem cell research space and resources will be instrumental in recruiting a senior leader to the IBSC, potentially from one of these fields, building upon our expertise in the epigenetic or RNA regulation of stem cells, or in one of the other stem cell focus areas. The Biomolecular Engineering Department, home to UCSC's world-class bioinformatics group, plans to make a complementary hire in the area of stem cell genomics - a scientist who blends bioinformatics with genome-wide experimental approaches to understand stem cell function. Both departments plan to make one additional stem cell hire each, with MCD focusing on human developmental biology, and BME focusing on a potential senior hire in stem cell bioengineering.

The proposed new space will also provide IBSC faculty with the only available core facilities for electrophysiology and high throughput sequencing on campus, new capacity for microscopy

(with up to 3 new microscopes being housed in the new facility), and new capability to perform specialized surgical procedures in the vivarium (such as stereotaxic surgery and ultrasound image-guided injections). It will also relieve some of the demand on the CIRM Shared Stem Cell Facility in Sinsheimer Labs, enabling the SSCF to focus on the goal of training investigators and students new to stem cells and assisting them with pilot, short-term, and small-scale experiments. The SSCF will continue to provide core culture facilities for faculty working on stem cells that are located in Sinsheimer Labs, and its specialized equipment (including the cell sorter, live imaging and confocal microscopes) will be available to all IBSC researchers.

In addition to new faculty and new capabilities, the proposed space will enable an expansion of IBSC research with projects that integrate the expertise of several strong research groups at UCSC focusing on problems in stem cell biology, and will facilitate the collaborative work of many of our faculty with colleagues at Stanford and other institutions. Molecular, cell and developmental biologists will work closely with bioinformaticists, engineers, and even astronomers to perform basic and discovery research that will contribute to the foundation of knowledge necessary for important advances in stem cell-based medicine. The proposed facility will position UCSC faculty to make significant headway in several keys areas of stem cell research, with a number of projects holding promise for translational or pre-clinical studies.

The secondary effect of creating the proposed stem cell space in the new Biomedical Sciences Facility is that space will be freed up in Sinsheimer Labs that can accommodate new faculty hires to fit with the research clusters that are already present in Sinsheimer, including chromatin and RNA biologists, and cell and developmental biologists working in non-mammalian model organisms, such as flies and worms. These hires will serve as colleagues to IBSC faculty working in the same research areas, and some may engage in stem cell research in their own labs.

3E Sustainability

Because this CIRM Major Facilities Grant project is to be constructed as part of a new building, the U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ being applied to determine sustainability performance is LEED for New Construction (LEED-NC v2.2). LEED-NC has a total of 69 possible points. Equivalency to "Certified" in this rating system, as required by CIRM, is 26 to 32 points. It is anticipated that this building will score at least 38 points, placing it at the top of the "Silver" category (33 to 38 points). The sustainability accomplishments for this facility are addressed below corresponding to each of the six LEED categories.

The *Biomedical Sciences Facility* will qualify for 9 points under Sustainable Sites. The site location does not include any sensitive elements (endangered species, wetlands, water bodies) or restrictive land types (parkland, farm land, low elevation), and more than 50% of the site area (excluding the building footprint) will be protected or restored with native or adapted vegetation. Sited on an existing parking lot in a forest of redwood and oak, as many of the existing trees as possible will be retained, providing both shade and aesthetic enhancements. Quantity control of stormwater runoff will be achieved by retaining water on site and slowly letting it recharge into the surrounding landscape. The heat island effect is partially mitigated by the building placement among the trees, built to a height not exceeding the surrounding canopy. It will be further reduced by using high albedo reflective roof surfaces. Light pollution reduction will be accomplished by utilizing the campus standard exterior site lighting fixture which controls light direction, while complying with code requirements for fixture distance and intensity without overlighting the area.

All four possible points for alternative transportation will be achieved as the building site is adjacent to campus bus and shuttle service, bicycle racks and shower/changing facilities will be provided, no new parking will be provided, and preferred parking is available nearby for fuel-efficient vehicles, as are recharge stations for electric vehicles.

Three points for water efficiency will be earned: Landscaping will utilize native species requiring little or no irrigation; the building will utilize low-flow plumbing fixtures, waterless urinals, and automatic sensors to ensure that fixtures are not left on; and possible re-use of stormwater and grey-water. Overall, water efficiency measures will result in aggregate use 30% less than the water use baseline calculated for the building.

The *Biomedical Sciences Facility* will earn 9 points under the Energy & Atmosphere credits. The building envelope and systems are designed to maximize energy performance through insulation that exceeds standards, sunshading, and deeply recessed windows that limit heat gain. Daylight computer models give specific feedback on efficient use of building lighting, turning lights off when light levels are met, thus further reducing heat gain. As a benefit of mild local climate and the campus sloping topography facing the ocean, all spaces are not required to be mechanically conditioned; offices and public spaces utilize natural ventilation and operable windows where possible. Heating is accomplished by efficient radiant wall units. Through advanced computer modeling, the air changes in the vivarium were significantly reduced. Mechanical systems are designed to use low-pressure drop air handlers reducing the energy use of the mechanical equipment. Most of the building's cooling loads are designed to be handled with a state-of-the-art technology: induction diffusers. These diffusers use radiant hydronics to condition the air at the point of use by means of efficient heat transfer. Between passive measures and conscious reduction of energy loads for the active mechanical systems, the building is anticipated to achieve an overall 28% improvement (6 points) compared to

baseline building performance according to ASHRAE/IESNA Standard 90.1-2004. Specification of the mechanical equipment calls for HVAC&R equipment with reduced refrigerant charge and increased equipment life, eliminating the need of CFC's. The Building Management System ties into the central Physical Plant controls and the building will be equipped with enhanced metering of all building mechanical and electrical systems. The UCSC campus utilizes 100% of its electrical energy from green power purchases.

At least four points for Materials and Resources will be achieved. Fifty percent diversion of construction waste management will be specified in contract documents and will be managed and documented by the project general contractor. It is anticipated that, through product specification and procurement management, the project will achieve the use of recycled-content materials of at least 20% (based on cost) of the total value of materials in the project. It is most likely that the recycled-content materials will be from concrete and from steel in the form of structural members, decks, reinforcing bars, metal claddings, and window systems. It is also intended that at least 10%, and hopefully 20% (based on cost), of building materials and products will be locally sourced (i.e. manufactured within 500 miles). If at all possible, at least 50% of wood-based materials and products used for this project will be from sources certified in accordance with the Forest Stewardship Council (FSC).

Indoor Environmental Quality is of utmost importance to the project design team, and will lead to the greatest number of points in this category (10-13). Permanent monitoring will be installed, providing feedback on the performance of the ventilation systems and alerting building operations personnel when necessary. The building will exceed minimum ventilation rates required by ASHRAE standard 62.1-2004 Chapter 6, by 30%. An IAQ management plan is required by UCSC's standard campus Division 1 specifications and calls for control of pollutant sources, sequenced installation of materials to avoid contamination of absorptive materials, HVAC protection during construction, prevention of contamination of occupied spaces, and control of contaminants prior to occupancy.

This project has specified the use of low-emitting volatile organic compounds (VOC's), including sealants and adhesives, which will follow Green Seal Standard for Commercial Adhesives, paints, coatings, and finishes, certified Green Label Plus carpet, and no composite wood and agrifiber products or laminating adhesives with added urea-formaldehyde resins. To further ensure indoor air quality, walk-off grates and grilles will be used at entries, copy rooms and janitor closets are separated, and the air system is filtered. With regard to design for and verification of thermal comfort, the building design meets ASHRAE Standard 55-2004, and a consulting commissioning agent has participated in design and specification of equipment. The commissioning consultant will provide validation, and will participate through project completion and handing over to the campus Physical Plant. Post-occupancy surveys will be done to validate comfort. The building design maximizes daylighting and achieves direct line-of-sight views to the outdoor environment in at least 90% of all regularly occupied spaces (laboratories and offices). Operable shades reset to the open position each day to assure use on a daily basis. The design uses as perceptibly clear glass as practical to maximize views and daylight while reducing heat gain.

The design features of the *Biomedical Sciences Facility* which qualify for LEED innovation credits are described in detail in the Innovation section of the application. They include: 1) the use of new-technology, energy-efficient cooling; 2) healthy housekeeping; 3) public information, education and awareness of green building systems in operation, and their benefits; 4) campus purchase of 100% renewable energy offsets; and 5) LEED accredited professionals on the project design, management and construction team.

3F Group 2 Moveable Equipment

The following table details the location and cost of Group 2 equipment that is necessary for the operation of the facility. This list includes items purchased by investigators who are moving to the new facility, items purchased by the existing vivarium, and items that must be purchased for the function of the core facilities and shared spaces as described in section 3C. Certain items that will be moved to the new facility, totaling $232,500, were purchased after August 24, 2007 and are being included as leverage. Items that are not yet purchased will be funded by a combination of various central and divisional campus sources. Additional equipment will be purchased as needed and as further funding becomes available.

Location in IBSC Facility	Item	#	Cost Each	Total
Purchased before 8/24/07				
Research lab	Dissecting microscopes	2	6,000	12,000
Procedure room	Tissue culture incubator	1	5,000	5,000
Research Lab	PCR machines	2	10,000	20,000
Equipment Vest.	(-70) Freezer	1	8,000	8,000
Research Lab	Micron sliding microtome	1	18,000	18,000
Research Lab	BTX ECM 830 Electroporator	1	7,000	7,000
Vivarium	Microinjection setup: inverted microscope, injectors, air table and accessories	1	70,000	70,000
Vivarium	Controlled rate freezer	1	15,000	15,000
Vivarium	Incubator	1	6,000	6,000
	Total			**161,000**
Purchased after 8/24/07 (Leverage)				
Research Lab	Microscope	1	48,000	48,000
Procedure Room	TC hood:Labconco Purifier Delta Class II type A2, 4’	1	6,000	6,000
Procedure Room	TC incubator: Revco Ultima II CO2	1	5,000	5,000
Equipment Vest.	-80 Freezer: Revco Elite-86	1	10,000	10,000
Research Lab	Thermocycler: BioRad PTC200	1	6,000	6,000
Vivarium	Irradiator: Faxitron CP160 X-ray	1	96,000	96,000
Research Lab	Centrifuge: Beckman Allegra 6KR	1	8,500	8,500
Procedure Room	Microscope: Zeiss Axiovert 40C Inverted	1	6,500	6,500
Vivarium	Ventilated cage rack	1	24,500	24,500
Vivarium	Biological Safety cabinet	2	11,000	22,000
	Total			**232,500**
To be Purchased Upon Facility Completion				
Cell Culture	Fluorescence Stereomicroscope (integrated into IVF table)	1	45,000	45,000
	37 Deg. C Double CO2 Incubator	4	8,352	33,408
	Delicase 4 Deg. C Refrigerator	1	5,240	5,240
	Axiovert Inverted Microscope	2	7,300	14,600
	Coulter Counter Z2 Analyzer	1	20,000	20,000
	Clinical Centrifuge with rotor, 96-well and 50ml buckets	1	9,858	9,858
Cytometry	Flow Cytometer (e.g. BD Analyzer II)	1	300,000	300,000
Microscopy	Widefield Microscope (e.g. Olympus)	1	100,000	100,000
	Two Photon/Confocal Combined Microscope (e.g.	1	700,000	700,000

	Olympus)			
Sequencing	Sequencer and related instruments (e.g. ABI SOLiD)	1	598,500	598,500
	Thermal Cycler (e.g. ABI VERITI)	1	8,000	8,000
Electrophysiology	A “rig” is composed of multiple components from various manufacturers: air table, recording cage and shielding, microscope, micromanipulator, equipment rack, amplifier/filter, digital oscilloscope, data acquisition, AC-DC converter, standard PC	1	150,000	150,000
Vivarium	Microinjection setup (manipulators, table, microscope, injector)	1	70,000	70,000
	Piezo Drill	1	16,000	16,000
	Changing Station (class A/B downdraft)	2	8,000	16,000
	Incubators (e.g. Forma IVF class)	2	8,000	16,000
	Cell Fusion/Electroporation System (e.g. BTX)	1	15,600	15,600
	Stereotaxic Injection Setup (e.g. Harvard Apparatus)	1	7,000	7,000
	Surgical Microscope with CCD Camera	1	12,000	12,000
	Ultrasound Biomicroscopy System (e.g. Visual Sonics Vevo 770 high-resolution in vivo imaging system with image-guided needle injection system)	1	219,250	219,250
	Electroporator (e.g. BTX ECM830, Harvard Apparatus)	1	7,000	7,000
	Flaming/Brown Micropipette Puller (e.g. P-97, Sutter Instrument)	1	8,000	8,000
Procedure Rooms	Cryostat	1	50,000	50,000
	Micron Sliding Microtome	1	19,000	19,000
	PCR Machines	1	10,000	10,000
	RealTime PCR	1	60,000	60,000
	Liquid Nitrogen Storage (e.g. Thermo Scientific Cryo Series)	1	12,898	12,898
	(-)80 Freezer	1	8,500	8,500
	Gel Documentation System	1	8,000	8,000
	High Speed Centrifuge	1	60,000	60,000
	Phosphorimager	1	75,000	75,000
	Bacterial Incubator Shaker (e.g. Air Bath Shaker BR-180LF)	1	17,240	17,240
	Speed Vac (e.g. Savant SPD-2010)	1	15,964	15,964
	TOTAL			**2,708,000**

3G Project Innovation

UCSC is intent on making the *Biomedical Sciences Facility,* including the IBSC space, a showcase of innovative technology, sustainability and efficiency. As a high-performance laboratory facility, it will be both a model and a living laboratory for display, discussion, instruction and development. Project innovations include technology, process and resources, and are described below.

Induction diffuser cooling system (also known as chilled beams) – this state-of-the-art technology, widely used in Europe but relatively new to the US, relies on diffusers using radiant hydronics to condition air at the point of use by means of efficient heat transfer. Combined with the use of low-pressure drop air handlers, these mechanical systems allow reduced-size air handlers and fans and will operate at a greatly reduced energy consumption level compared to conventional mechanical equipment. Factoring in life-cycle cost, the induction diffuser system is less expensive than standard systems, with potential annual energy savings of $65,000 to $95,000. In addition, there is a PG&E incentive rebate available upon implementation of this design.

Healthy housekeeping – The UCSC facilities organizations responsible for this building are committed to implementing and demonstrating a plan to use environmentally friendly cleaning products and procedures.

Outreach – The University intends to use signage, "systems made visible," and other means of disseminating information about the many unique and exciting green building features of this facility, and its energy performance over time. The University further commits to using features of the facility to build public awareness and, ideally, stimulate further opportunities and integration into program curriculum.

Renewable energy – The UCSC campus purchases 100% renewable electrical energy. In January 2007, the US Environmental Protection Agency's (EPA) College and University Green Power Partners, which promotes purchases of renewable resources, named UC Santa Cruz its sixth largest green power purchaser in the country, based on purchases through Dec. 31, 2006. Based on national average utility subregion emissions rates, the U.S. EPA estimated that UC Santa Cruz's purchase of 100% renewable energy is equivalent to avoiding the carbon dioxide emissions of nearly 7,000 cars per year, or avoiding the equivalent carbon dioxide emissions associated with nearly 3.6 million gallons of gasoline annually.

LEED Accredited Professionals – the team working on the Biomedical Sciences Facility includes several LEED AP individuals, including the architect of record (at EHDD), the mechanical and electrical engineers, the landscape architect, and several members of the university's project management team. The general contractor will be LEED AP as well.

Labs21 partnership - The Laboratories for the 21st Century (Labs21) program is co-sponsored by the EPA and the US Department of Energy (DOE). Labs21 is dedicated to the pursuit of sustainable, high performance, and low-energy laboratories that will:

- Minimize overall environmental impacts;
- Protect occupant safety;
- Optimize whole building efficiency on a life-cycle basis;
- Establish goals, track performance, and share results for continuous improvement.

Labs21 offers facility designers, engineers, owners, and managers the information exchange and education through a partnership program, training and tools. The typical laboratory uses far more energy and water per square foot than the typical office building, due to intensive ventilation requirements and other health and safety concerns. These facilities, therefore, present an exceptional opportunity for advanced, environmentally preferred, building technologies.

The guiding principle of the Labs21 approach is that improving the energy efficiency and environmental performance of a laboratory facility requires examining the entire facility from a "whole building" perspective. From the beginning of the design process, the University and the *Biomedical Sciences Facility* design team were, and are, committed to this approach. As a Labs21 program partner, UCSC received design guidance and expertise from engineers at Lawrence Berkeley National Laboratory (LBNL). LBNL was a Labs21 pilot partner in 2002 and received the Department of Energy (DOE) 2006 Federal Energy and Water Management Award recognizing outstanding contributions made toward the efficient use of energy and water resources in the federal sector during FY 2005. The design team held several charrettes with the Labs21 professionals to determine how to achieve the Labs21 program and UCSC campus energy-efficiency goals.

Savings By Design (SBD) energy efficiency partnership program – Savings By Design is a program to support the design and construction of high-performance nonresidential buildings. It is sponsored by four of California's utilities under the auspices of the Public Utilities Commission, and offers design assistance, energy and life-cycle cost analysis, and design and rebate incentives. Energy performance optimization can be achieved when a building's systems are properly integrated. Using a simplified energy simulation modeling tool, the SBD representative worked with the project design team to identify system options and estimate the associated potential savings. At the same time, the SBD advisor identified which systems qualify for potential incentives.

For the *Biomedical Sciences Facility,* the project mechanical engineer worked with SBD directly, specifically reviewing HVAC systems, service hot water systems, and electrical and utility systems for energy efficiency opportunities. SBD reviews working drawings to ensure system design and specification compliance, and as-built conditions to ensure that design requirements have been met. The Savings By Design partnership program offers incentives for project owners as well as the participating design professionals.

Fully integrated design approach – The Physical Planning and Construction Department at UC Santa Cruz has a long-established practice of involving all building stakeholders in its building development, from concept, through design, construction and post-occupancy operations. As with previous projects, the creation of the *Biomedical Sciences Facility* involved multiple charrettes and working meetings, with participation of the planned building occupants, including the Dean of Physical and Biological Sciences, campus and division facilities organizations (including trades, grounds and transportation), Capital Planning, campus architects and engineers, consulting team of architects, engineers and other experts, such as the external commissioning agent, as well as the special program advisors mentioned previously. It has been clearly demonstrated that such an approach stimulates creative design solutions and leads to a project outcome with fewer problems, surprises or delays, resulting in higher building performance and end-user satisfaction.

4 Shared Facilities

With the funding of this proposal together with our previously funded Shared Stem Cell Facility, CIRM will have enabled the creation of approximately 15,100 asf of efficient, well-planned, highly-functional, non-federally regulated stem cell research space at UCSC. The IBSC facility will rapidly transform stem cell research at UCSC. Prior to CIRM support, non-federally regulated stem cell research space was limited to several small cell culture rooms of a single investigator. UCSC faculty have proven that they have much to offer in the field of stem cell research, and CIRM facility support will allow them to rapidly build on early success and expand further into human embryonic stem cell research. All of the facilities that CIRM is creating will be shared among the existing 18 IBSC faculty as well as newly recruited faculty. Non-IBSC faculty performing biomedical research will have access to the space on an availability basis, and requests for access by investigators from other institutions will be considered on an individual basis.

The proposed dedicated stem cell floor concentrates researchers with common interests and resource requirements - for human and mouse stem cell research - into a common location. This will lead to more efficient use of common/shared resources and space. Sharing of equipment is a cost effective mechanism for individual investigators to gain access to state-of-the-art, specialized equipment that is essential for ground-breaking stem cell research, yet not utilized full-time by any one laboratory. This concentration also promotes interaction and maximizes the effective use of support personnel and space. The shared space, equipment and staffing therefore translates to lower costs per investigator for doing stem cell research. In addition, the availability of new core facilities and technical personnel to support CIRM-funded investigators will greatly facilitate their research progress, and will assist UCSC in recruiting new faculty and reaching a critical mass of stem cell researchers. The higher capacity and capabilities offered by these facilities will therefore translate to more investigators, more projects, and faster results.

The proposed IBSC stem cell research labs in the new Biomedical Sciences Facility will complement the nearly completed Shared Stem Cell Laboratory (SSCF) in Sinsheimer Laboratories. The IBSC facility will allow an optimal division of function between the two sites of stem cell work - the IBSC floor will primarily serve the needs of stem cell-focused faculty in the Biomedical Sciences building, while the core culture room in the SSCF will be used by stem cell researchers in Sinsheimer Labs. The IBSC facility will allow optimal use of the new state-of-the-art vivarium in the Biomedical Sciences building. The SSCF in Sinsheimer Laboratories will continue to serve as a training facility for students and postdoctoral researchers, and as a site for pilot, short-term and small scale experiments. Both the IBSC facility and the SSCF will have microscopy and FACS/cytometry cores, which are required in both locations to serve the needs of local investigators. However, each core will share staffing and will function as one unit in terms of purchasing of supplies, scheduling usage, and other operational considerations, thus eliminating unnecessary costs that would otherwise be associated with operating duplicate facilities.

IBSC faculty will have access to numerous shared spaces in other areas of the Biomedical Sciences Facility at no cost to this CIRM project – including all of the vivarium support spaces shown in Subpart F Plans pages A2.00A and A2.00B (e.g. barrier and non-barrier animal receiving, necropsy & freezer room, clean & dirty side cage washes, feed and bed, surgery suite, barrier and non-barrier showers and lockers), and an approximately 1,000 asf shared conference room located on the 2nd floor. They will also continue to have access to existing

facilities that are not dedicated to stem cell work. UCSC's Microarray Facility, developed in 2000, provides equipment, technical expertise, and data storage for genomics research. The staff offers expertise in experimental design, protocol development, data management, and data analysis. UCSC's Transgenic Mouse Facility, which began production in 2006, produces specific pathogen free congenic and F1 hybrid transgenic mice. The CBSE Computing Clusters and Web Servers have been in existence since 2000 and support the Genome Browser and computational genome research conducted within the CBSE. This resource is maintained as a state-of-the-art 24/7 parallel processing facility by 3.5 full time system administrators. Faculty also have access to shared confocal and electron microscopes, as well as electron spin resonance, laser spectroscopy, X-ray crystallography, nuclear magnetic resonance, and proteomics equipment.

5A Capital Improvement Budget Narrative

CIRM project costs are reasonable and necessary.

Construction costs are the expected actual costs at time of construction. Eleven months of escalation from the date of the estimate (February 2008) to the start of construction (January 2009) is assumed at an annual rate of 8%. Estimated costs are based on recent experience in the local and regional construction markets. Construction costs include construction management services of the General Contractor/Construction Manager at Risk. All subcontracts will be competitively bid. Prevailing wages will be paid.

The CIRM construction budget does NOT include the following costs which are already included in the base construction budget for the Biomedical Sciences Facility:

- all site, foundation, and roof costs (not prorated to this CIRM project)
- unfinished floor, ceiling, and exterior walls, vertical circulation, and capped off utility risers at level 4 and a portion of the basement

The CIRM construction budget DOES include the following costs:

- build out of shell space at level 4 and a portion of the basement for CIRM stem cell research program

Construction support activities include builder's risk insurance, start-up and equipment connections, router hubs, utility shutdowns and relocations, remote contractor staging, signage and keying, and commissioning.

The project budget includes a reasonable level for contingencies during construction for new construction (5%) based on normal budgeting practices.

Group 2 moveable equipment in the budget includes all scientific equipment necessary to make the stem cell facility fully functional upon completion.

6C Operation and Management of CIRM IBSC Facility

The IBSC Facility to be constructed on the 4th floor of the Biomedical Sciences Facility and a portion of the basement will be lead scientifically by the IBSC Director and Associate Director, currently Professors David Haussler and Susan Strome. They will provide scientific leadership to guide the types of research taking place and the faculty who will occupy the facility, including active participation in recruiting new faculty and staff to the IBSC. Scientific leadership is expected to be turned over to a new senior faculty hire within a year or two of completion of the facility.

Operation of the facility will be managed by a Senior Research Scientist having significant experience in human embryonic stem cells and facility operations. This position will have scientific as well as managerial responsibilities. Scientifically, the position will provide guidance to investigator labs on their stem cell related research projects, and as appropriate, provide scientific direction and analysis. It will lead or assist with research and equipment grant proposals and participate in manuscript preparation as appropriate. On the management side, this position will be responsible for establishing and enforcing policies and procedures for the core facilities located on the floor, including access to cores and associated resources as well as usage and recharge policies for each core. It will also be responsible for interfacing with campus regulatory units - such as the Institutional Review Board, the Research Oversight Committee for Stem Cells, and Environmental Health and Safety - ensuring that all regulatory assurances and approvals are in place and up-to-date.

A Stem Cell and Transgenic Manager will perform similar responsibilities as the Senior Research Scientist but with focus on the usage of animals (mice) in stem cell research. This position will provide scientific guidance to investigator labs, assistance with specialized animal techniques, and leadership or assistance in writing grant applications and manuscripts. On the management side this position will interface with and support the campus Vivarium Director in developing and enforcing policies and procedures for the new vivarium, and in ensuring that all animal usage protocols and regulatory assurances are in place and up to date.

In addition to the two management level positions, five technical staff are envisioned for the combined IBSC Facility and Shared Stem Cell Facility cores: Two Stem Cell Technicians primarily focused on growing and manipulating human and mouse embryonic stem cells (one for each location); a Cytometry Technician responsible for running and maintaining the fluorescence activated cell sorting and flow cytometry facilities and instruments; a Microscopy Technician, responsible for running and maintaining the microscope facilities and instruments; and a Sequencing Center Technician, who will run and maintain the Sequencing Facility and equipment. In each core, investigator labs will generally perform their own work and supply their own consumable materials and reagents. A recharge system will be put in place to cover equipment maintenance costs, provided consumables and a percentage of core staff time.

The two managers will be supervised by the IBSC leadership, and the technical staff will each have its own IBSC faculty supervisor. This group of faculty together with the managers will comprise the internal IBSC Executive Committee, responsible for making policy and hiring decisions of a global (facility-wide) nature. In addition, an External Advisory Board comprised of pre-eminent stem cell faculty from other institutions (listed in Section 3A) has been formed and will provide advice and feedback regarding UCSC's scientific direction and operational plans. One of the technical staff will also serve an administrative role in supporting these committees.

Salary and benefits for these seven positions are estimated at $572,000. Non-permanent funding (3 years) had previously been secured for 3 of the positions from various units on campus and from the CIRM SSCF operating budget. The balance of the personnel budget will be funded through a combination of indirect cost returns to the campus, recharges, UCSC's Institute for Quantitative Biosciences (QB3) local operating budget, and gifts from donors (a stem cell research fundraising campaign has recently gained momentum). These fund sources will also provide support for other operational costs of the facilities, such as equipment maintenance, shared supplies and minor equipment, which are estimated at $300,000 per year.

Operations and Maintenance of Plant (OMP) will be funded by the State. The campus will submit a request for increased State-OMP workload funding for fiscal year 2010-11, when the new facility will come online. OMP funding will provide custodial services, purchased utilities, repairs, maintenance, etc.

7B Approvals

The campus is well positioned to deliver the project on or before the proposed schedule in Section 7A. This schedule shows the building will be available for occupancy and installation of equipment by December 1, 2010, two years and five months after the Notice of Grant Award on July 1, 2008.

100% Construction Documents (CDs) have been completed for the base scope of the Biomedical Sciences Facility project and 100% Design Development (DDs) have been completed for the CIRM modifications to the base scope. The remaining steps are to:

1) Complete CDs for CIRM scope. The 100% CD Specifications included in Subpart F of this application packet have already been amended to include all the CIRM equipment. However, the CD drawings still need to be completed. This work will take four months and begin in June 2008.

2) Amend the Santa Cruz campus Capital Improvement Program to include this CIRM project. The campus will continue to work with UC Office of the President Capital Programs staff on this. Budget approval will be in July 2008 either before the full Board of Regents or under delegated authority.

3) Satisfy any additional environmental review requirements and obtain approval of Timber Harvest Plan and water quality waiver (see text below).

The proposed Biomedical Sciences Facility was analyzed in a CEQA Mitigated Negative Declaration (MND) and was approved by The Regents in November 2006. As a result of a legal challenge the MND approval was invalidated and the case is currently being mediated. A condition of a mediated settlement, if reached, may be that no further CEQA approval for the Biomedical Sciences Facility is required. If not, the approval period would be extended; however, the campus anticipates that any required further CEQA analysis would be considered by The Regents no later than September, 2008.

Construction of the Biomedical Sciences Facility also is subject to approval by the California Department of Forestry and Fire Protection (CDF) of a Timberland Conversion Permit and Timber Harvest Plan (THP). The Timberland Conversion Permit was approved in March 2007. The Campus currently is revising the THP to address concerns raised during the recent public review period and will submit the revised document to CDF by the beginning of March 2008. It is estimated that CDF would approve the THP by June, 2008.

Following approval of the THP, an approval will be needed by the Regional Water Quality Control Board for a water quality waiver (an application for which has already been submitted). There is no official timeline for this approval, but it is anticipated to require several weeks after the approval of the THP.

All required project approvals are anticipated to be complete by Fall, 2008.

7C Implementation Team

The architectural firm for the *Biological Sciences Facility* project (including the CIRM Major Facilities Grant project) is **Esherick, Homsey, Dodge and Davis Architecture** and conducts business as **EHDD Architecture**, with Senior Principal in Charge Chuck Davis, FAIA, Principal in Charge Scott Shell, AIA, and Designer and Project Manager David Hurley.

The EHDD consultants who completed the documents and will oversee construction are: Glen Berry of **Design for Science** for laboratory planning; Joseph Spinelli, DVM for vivarium planning, **Rutherford & Chekene** as structural engineer, **Kennedy/Jenks Consultants** as civil engineer, **GLS Landscape/Artchitecture** as landscape architect, Principal Alice Nguyen and Nick Mata of **Davis Langdon** as cost estimators. The mechanical, electrical, and plumbing engineers were **Guttman and Blaevoet** with **Rumsey Engineers** as Design Engineers and commissioning agent.

EHDD has successfully completed a series of major construction projects for UCSC, including a project that constructed both the bookstore and graduate commons buildings and the associated student activities plaza, and the Science and Engineering Library. EHDD has also worked on the original UC Santa Cruz Long Marine Laboratory Master Plan, and they were the architects for the Monterey Bay Aquarium's original facility.

EHDD has developed a specialty in designing laboratories and research facilities for academic clients and has extensive experience with complex projects at all ten University of California campuses. At UC Irvine, the company designed the 53,000 SF Croul Hall Earth System Science Building, the 83,000 SF Sprague Hall Biomedical Lab, and the 37,300 SF Hewitt Hall Biomedical Lab; at UC Merced the 170,000 SF Science and Engineering building and Vivarium; at UC San Francisco, the 9,500 SF P-3 biohazard lab renovation at the Institute for Neurodegenerative Diseases; and at UC Santa Cruz, the 62,000 SF Interdisciplinary Sciences Building.

EHDD is committed to producing high-quality documents that meet the challenges of low-bid procurement. To maintain high standards, the firm has established a quality assurance program that leverages the experience of their most knowledgeable staff to insure consistency in the quality of construction documents. The firm makes a commitment to keep changes in construction due to errors and omissions to below 3% of the final construction cost of the project.

The Construction Management General Contractor (CMGC) At Risk for this project is a well known, large Silicon Valley contractor, **Devcon Construction**. Founded in May 1976, Devcon has built over 30 million SF of office, commercial, and industrial space throughout Northern California. The company was ranked in the top 100 general contractors nationwide in Engineering News Record for 2006. Devcon's primary goal is to deliver the finest quality construction within the project budget. They have an outstanding success record of completing projects on schedule and within budget. Their excellent reputation provides over 90% of customers as repeat clients.

Comparable projects include the five-story, 159,000 SF Network Appliance Building 7 in Sunnyvale, CA, the 5 three-story, 1,250,000 SF Cisco campus Site 5 buildings, and the 56,000 SF 49'ers Training Facility in Santa Clara, CA. Recent projects on the UCSC campus include the 221,800 square foot Infill Apartments, the five-story 87,000 sq. ft. Humanities and Social Sciences Facility, and the five-story 280,000 sq. ft. McHenry Library Addition and Renovation.

The UCSC project manager is Julian Halkett, in Physical Planning and Construction. Julian has over 15 years of project and construction management experience working as both an architect and a contractor. He is good at motivating, directing and inspiring a team of consultants to produce complete and coordinated sets of construction documents. He sets

a very high standard for project deliverables and prides himself on his ability to produce construction documents that limit financial exposure to the university and the design consultants. As a construction manager he strongly believes in flexibility and creating a collaborative team environment with contractors. He believes information and direction should be issued clearly, concisely and in a timely manner to assist design teams and contractors in completing projects on schedule. He is a thorough communicator, detail-oriented, with a practical yet very creative approach to design and construction challenges. Julian’s portfolio of work ranges from $100K to $150M projects in higher education, aviation, hospitality and K-12.

8C Assignable and Gross Square Feet

	Rm #	ASF
CIRM RESEARCH LAB 4A	0415	732
CIRM RESEARCH LAB 4B	0425	752
CIRM RESEARCH LAB 4C	0435	752
CIRM RESEARCH LAB 4D	0445	752
CIRM RESEARCH LAB 4E	0455	752
CIRM RESEARCH LAB 4F	0465	747
1. Research Lab Space Assigned to PIs		**4,487**
2. Research Lab Support Space Assigned to PIs		**0**
3. Shared Research Lab Space		**0**

CIRM AUTOCLAVE	0415B	163
CIRM DARK ROOM	0415D	60
CIRM DARK ROOM/PROCEDURE	0435E	113
CIRM ENV. ROOM (COLD ROOM)	0435C	189
CIRM ENV. ROOM (WARM ROOM)	0445B	136
CIRM EQUIPMENT VESTIBULE	0415A	384
CIRM EQUIPMENT VESTIBULE	0435A	390
CIRM EQUIPMENT VESTIBULE	0445A	383
CIRM FUME HOOD	0425A	169
CIRM FUME HOOD	0435D	178
CIRM FUME HOOD	0455A	181
CIRM PROCEDURE	0425B	163
CIRM PROCEDURE	0445C	170
4. Shared Research Lab Support Space		**2,679**

CIRM CELL CULTURE	0463	194
CIRM CELL CULTURE	0464A	686
CIRM CELL CULTURE ANTE ROOM	0464	43
CIRM CYTOMETRY	0461	159
CIRM ELECTRO PHYSIOLOGY FACILITY	0435B	160
CIRM MICROSCOPY	0445D	158
CIRM SEQUENCING CENTER 1	0415E	95
CIRM SEQUENCING CENTER 2	0415C	163
Subtotal 4th floor		1,658
CIRM AIR LOCK	0015A	64
CIRM AIR LOCK	0035A	57
CIRM ART ANIMAL HOLDING ROOM	0015B	467
CIRM ART ROOM	0015E	243
CIRM HALLWAY	0015	346
CIRM HOLDING VESTIBULE	0015	199
CIRM JAN.	0015C	56
CIRM LONG TERM STORAGE & BREEDING	0035B	337
CIRM MICROINJECTION	0015D	180
CIRM TEMPORARY HOLDING/PROCEDURE	0035H	199
Subtotal Vivarium		2,148
5. Core Lab Space		**3,806**

CIRM FACULTY OFFICE	0434	140
CIRM FACULTY OFFICE	0438	140
CIRM FACULTY OFFICE	0440	140
CIRM FACULTY OFFICE	0444	140
CIRM FACULTY OFFICE	0450	140
CIRM FACULTY OFFICE	0446	140
6. PI Offices		**840**

CIRM POST DOCS (4) OFFICE	0412	277
CIRM POST DOC/STAFF (2) OFFICE	0430	140
CIRM STAFF (2) OFFICE	0420	141
7. Other Offices		**558**

CIRM CONFERENCE	0460	306
CIRM INTERACTIVE	0416	131
CIRM INTERACTIVE	0454	146
CIRM OFFICE SERVICE	0401	84
CIRM STORAGE	0410	42
8. Admin & Other Support Space		**709**
Subtotal 4th Floor ASF		10,931
Subtotal Vivarium ASF		2,148
Total ASF		**13,079**

Subtotal 4th Floor GSF	17,514
Subtotal Vivarium GSF	2,315
Total GSF	**19,829**

8D Provision of Space as Described in Part 1

In our part 1 application we proposed dedicating approximately 13,200 asf of research space in the Biomedical Sciences Facility to stem cell research. We envisioned the same core facilities that we now describe in this proposal, and the same use by faculty of the Institute for the Biology of Stem Cells. We now have a more accurate figure for the area of the involved space – 13,079 asf – as opposed to our estimate of 13,200 asf from last fall. We have not significantly altered our space planning since the Part 1 proposal was submitted. We deleted one wall from between two cell culture rooms to create one large room, but otherwise all of the individual rooms are the same as planned in the Part1 application. However, the CIRM categories have changed from Part 1 to Part 2.

CAPITAL BUDGET
Major Facilities Grant Program

CALIFORNIA INSTITUTE FOR REGENERATIVE MEDICINE

CIRM Application # FA1-00617-1

Project Title:	Number:	Prepared by: Julian Halkett
IBSC Facility	Applicant Reference #	Phone #: (831) 459-4237
		Email: halkett@ucsc.edu

line	COSTS/FUNDING	CIRM	Matching	Other	Total	%
1	Construction	$8,565,000	$0	$0	$8,565,000	86.0%
2	Construction support	$100,000	$0	$0	$100,000	1.0%
3	Design, struct/seismic		$0	$0	$0	0.0%
4	Design, Other		$512,000	$0	$512,000	5.1%
5	Proj Mgmt & admin		$346,000	$0	$346,000	3.5%
6	SUBTOTAL	$8,665,000	$858,000	$0	$9,523,000	95.7%
7	Contingency 5.0%		$433,000	$0	$433,000	4.3%
8	TOTAL P_W_C	$8,665,000	$1,291,000	$0	$9,956,000	100%
9	Group 2 Equipment		$442,000	$2,498,500	$2,940,500	
10	TOTAL PROJECT	$8,665,000	$1,733,000 *	$2,498,500	$12,896,500	

ANALYTICAL DATA	CIRM funds		Matching+Other Funds	Total
Assignable square feet				13,079 ASF
Gross square feet				19,829 OGSF
Ratio (ASF Current / OGSF)				66.0% to 1.00
PWC Cost Per ASF	$663	/ASF	$99 /ASF	$761 /ASF
PWC Cost Per OGSF	$437	/OGSF	$65 /OGSF	$502 /OGSF
Equipment Cost Per ASF				$225 /ASF
Equipment Cost Per OGSF				$148 /OGSF

NOTES (line number):

1 Prime contract and subcontracts for construction work subject to prevailing wage requirements

2 Construction support activities are performed by other than prime contractor or subcontractors such as institutional service (e.g. utility shutdowns,locksmith, commissioning, etc).

3 The portion of design fees related to structural engineering and seismic safety plan check

4 The remaining design fees (i.e. total design fees less line 3 amount)

5 The amount budgeted for project management inspections, testing, permits

7 The amount budgeted for change orders during construction; any net savings (after augmentations) will be shared with CIRM.

9 The amount budgeted for inventorial (Group 2) equipment to be capitalized as part of the project; leverage may include donated equipment.

10* The amount budgeted for matching funds must equal 20 percent of the CIRM funding.

Applicant: University of California, Santa Cruz

Fields to complete (over-write sample)

COST PLAN SUMMARY		
P or W Submittal		
		Construction Cost ($X1,000)
1. Foundations		0
2. Vertical Structure		0
3. Floor & Roof Structures		0
4. Exterior Cladding		87
5. Roofing & Waterproofing		0
Shell (1-5)		*87*
6. Interior Partitions, Doors & Glazing		913
7. Floor, Wall & Ceiling Finishes		477
Interiors (6-7)		*1,390*
8. Function Equipment & Specialties		1,518
9. Stairs & Vertical Transportation		0
Equipment &Vertical Transportation		*1,518*
10. Plumbing Systems		728
1 1. Heating, Ventilating & Air Conditioning		2,357
12. Electric Lighting, Power & Communications		1,033
13. Fire Protection Systems		62
Mechanical & Electrical		*4,180*
Total Building Construction (1-13)		7,174
14. Site Preparation & Demolition		0
15. Site Paving, Structures & Landscaping		0
16. Utilities on Site		0
Total Site Construction (14-16)		0
TOTAL BUILDING & SITE (1-16)		7,174
General Conditions	*4.00%*	287
Contractor's Overhead & Profit or Fee	*15.38%*	1,103
ESTIMATED CONSTRUCTION BUDGET		8,565
(at time of award)		

100% CD CIRM
COST ESTIMATE

for

UCSC Biomedical Sciences Facility
CIRM Breakout
Santa Cruz, California

DAVIS LANGDON

February 22, 2008

February 22, 2008

David Hurley
EHDD Architecture
500 Treat Avenue
Suite 201
San Francisco, California 94110

UCSC Biomedical Sciences Facility
CIRM Breakout
Santa Cruz, California

Dear David:

In accordance with your instructions, we enclose our 100% CD CIRM Cost Estimate for the project referenced above.

We would be pleased to discuss this report with you further at your convenience.

Sincerely,

Alice Nguyen

Davis Langdon 0148-5342

Enclosures

100% CD CIRM COST ESTIMATE

for

UCSC Biomedical Sciences Facility
CIRM Breakout
Santa Cruz, California

EHDD Architecture
500 Treat Avenue
Suite 201
San Francisco, California 94110

Tel: (415) 285-9193
Fax: (415) 285-3866

February 22, 2008

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343 Sansome Street
Suite1050
San Francisco
California 94104
Tel: 415.981.1004
Fax: 415.981.1419
www.davislangdon.com

CONTENTS

BASIS OF COST ESTIMATE

Cost Estimate Prepared From	Dated	Received
Drawings issued for cost estimate		
100% CD Set	07/16/07	07/17/07
CIRM Grant Sketch Plans	02/15/08	02/19/08

100% Construction Documents Specification
Narrative - Questions/Comments on 02/01/08 Grant Sketch Plans
UCSC IBSC Narrative Revised, dated 01/30/08
Discussions with the Project Architect

Conditions of Construction

The pricing is based on the following general conditions of construction

A start date of January 2009

A construction period of 26 months

Devcon will act as General Contractor / Construction Manager for the project; subcontractors will be competitively bid

There will not be small business set aside requirements

The contractor will be required to pay prevailing wages

There are no phasing requirements

The general contractor will have full access to the site during normal business hours

INCLUSIONS

The base project scope is comprised of a five level Biomedical Research Lab on the University of California Santa Cruz campus. Programmatic requirements include Vivarium construction at the basement level and general research lab space at the four above-grade levels. The overall building area is 94,695 gross square feet.

This estimate addresses construction at the fourth level and a small portion of the basement Vivarium. The estimate shows the difference in cost between a "shelled" fourth floor and basement area and a fully built out CIRM program.

The CIRM program buildout is similar in most regards to the base scope general research space. Specific differences include additional lab cabinetry, biosafety cabinets, increased heat load, and UV lighting.

INCLUSIONS

BIDDING PROCESS - MARKET CONDITIONS

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of 3 bidders for all items of subcontracted work. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since Davis Langdon has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents Davis Langdon's best judgment as professional construction consultant familiar with the construction industry. However, Davis Langdon cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

EXCLUSIONS

Specialty CIRM program equipment except as specifically identified

Owner supplied and installed furniture, fixtures and equipment

Loose furniture and equipment except as specifically identified

Security head end equipment, DVD/VCR, monitors

Audio visual equipment

Switching and routing equipment

Clock system

Paging system

Compression of schedule, premium or shift work, and restrictions on the contractor's working hours

Cost escalation beyond a start date of January 2009

SHELL TO CIRM FITOUT COST COMPONENT SUMMARY

		Gross Area: 19,829 SF	
		$/SF	$x1,000
1. Foundations		0.00	0
2. Vertical Structure		0.00	0
3. Floor & Roof Structures		0.00	0
4. Exterior Cladding		4.36	87
5. Roofing, Waterproofing & Skylights		0.00	0
Shell (1-5)		4.36	87
6. Interior Partitions, Doors & Glazing		46.03	913
7. Floor, Wall & Ceiling Finishes		24.05	477
Interiors (6-7)		70.08	1,390
8. Function Equipment & Specialties		76.56	1,518
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		76.56	1,518
10. Plumbing Systems		36.71	728
11. Heating, Ventilating & Air Conditioning		118.88	2,357
12. Electric Lighting, Power & Communications		52.10	1,033
13. Fire Protection Systems		3.11	62
Mechanical & Electrical (10-13)		210.80	4,180
Total Building Construction (1-13)		361.81	7,174
14. Site Preparation & Demolition		0.00	0
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		0.00	0
TOTAL BUILDING & SITE (1-16)		361.81	7,174
General Conditions	4.00%	14.47	287
Contractor's Overhead & Profit or Fee	15.38%	55.64	1,103
RECOMMENDED BUDGET	*January 2009*	431.92	8,565

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
No change in scope				
				0
2. Vertical Structure				
No change in scope				
				0
3. Floor and Roof Structure				
No change in scope				
				0
4. Exterior Cladding				
Interior finish to exterior walls				
Gypsum board on metal furring, taped, sanded and painted	6,723	SF	12.87	86,519
				86,519
5. Roofing, Waterproofing & Skylights				
No change in scope				
				0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
6. Interior Partitions, Doors & Glazing				
Partition framing and cores				
Metal stud framing				
<= 3-5/8"	19,095	SF	10.53	201,070
4"	1,110	SF	11.70	12,987
6"	1,020	SF	16.38	16,708
Plywood	600	SF	5.85	3,510
Backer plate in partition wall				
Core board	1,110	SF	5.85	6,494
Fire rated walls	430	LF	23.40	10,062
Partition framing and cores				
Gypsum board, painted	37,455	SF	8.19	306,756
Gypsum board underlayment	4,245	SF	4.39	18,625
Sound insulation				
Batt insulation	18,720	SF	0.88	16,427
Interior doors and frames and hardware				
Wood doors				
Single	9	EA	1,872.00	16,848
Hollow metal				
Single	24	EA	1,872.00	44,928
Double	7	PR	3,276.00	22,932
Dark room door	1	EA	5,000.00	5,000
Vision glass	1	LS	24,735.26	24,735
Rating	1	LS	1,462.50	1,463
Allowance for automatic door operators, including exterior entry doors	2	PR	9,360.00	18,720
Miscellaneous hardware	1	LS	58,207.50	58,208
Interior firesafing and sealants	17,514	GSF	0.59	10,246
Basement space				
Airlock glazing	40	SF	234.00	9,360
Partition type A1	87	LF	503.13	43,772
Partition type C1	67	LF	344.33	23,070
Partition type C13	18	LF	442.03	7,956

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Backer plate in partition wall	188	LF	11.70	2,200
Fire rated walls	87	LF	23.40	2,036
Doors with stainless steel frames and hardware	1	LS	18,098.44	18,098
Interior firesafing and sealants	1,895	SF	0.59	1,109
Seal penetrations and vermin control	1,895	SF	4.97	9,423
				912,742

7. Floor, Wall & Ceiling Finishes

Floors				
Resinous flooring with integral base	12,166	SF	11.70	142,345
Resilient tile	2,806	SF	5.85	16,415
Static dissipative	102	SF	8.19	833
Carpet	2,440	SF	5.85	14,274
Vapor emission testing per unit price, allowance	1	LS	5,850.00	5,850
Credit to upgrade from sealed concrete (shell scope) to finished floors	17,514	SF	(2.34)	(40,983)
Bases				
Rubber	1,458	LF	3.22	4,690
Walls				
Acoustic wall panel	338	SF	35.10	11,864
Tile	1,220	SF	17.55	21,407
Column furring				
Furred gypsum board	2,531	SF	9.36	23,693
Ceilings				
Painted gypsum board	2,314	SF	23.40	54,152
Premium for epoxy paint to ceilings at restrooms	812	SF	3.51	2,850
Trim detail at gypsum board ceilings at Conference Rooms	334	LF	35.10	11,732
Sloped gypsum board at Research Labs	750	SF	25.74	19,310
Gypsum board headers at Research Labs fixed cabinetry, assume "in plane" of acoustic ceiling tile	123	SF	23.40	2,867
Vertical gypsum board surfaces	329	SF	35.10	11,554

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Window shade pocket detail	33	LF	87.75	2,852
Light cove at restrooms	22	LF	117.00	2,574
Acoustic ceiling tile	12,057	SF	7.02	84,637
Paint exposed structure and services	1	LS	2,925.00	2,925
Credit to upgrade from painted ceilings (shell scope) to finished ceilings	17,514	SF	(2.34)	(40,983)
Basement space				
Resinous flooring with integral base	1,895	SF	11.70	22,172
Vapor emission control	1,895	SF	4.10	7,760
Epoxy paint to walls	4,436	SF	2.34	10,380
Furred columns	90	SF	19.89	1,790
Gypsum board ceiling with epoxy paint	1,895	SF	29.25	55,429
Access hatches	14	EA	1,755.00	24,570
				476,957

8. Function Equipment & Specialties

Research Labs				
Lab casework				
Moveable table LB1	36	EA	1,404.00	50,544
Moveable cabinet MC1	48	EA	702.00	33,696
Moveable cabinet MC2	36	EA	351.00	12,636
Desk unit - freestanding counter	198	LF	234.00	46,332
BC1, 3' wide	12	EA	1,111.50	13,338
BC2, 3' wide	12	EA	1,111.50	13,338
BC8, 3' wide	12	EA	1,111.50	13,338
KS, 3' wide	12	EA	292.50	3,510
WC1, 3' wide, suspended from unistrut	18	EA	936.00	16,848
WS4, 3'-0" wide	6	EA	152.10	913
SS2 single sided suspended from on unistrut frame, 3'-0" wide	24	EA	117.00	2,808
SS1 double sided suspended from on unistrut frame, 3'-0" wide	45	EA	292.50	13,163
Low partition with tack board and 12" epoxy shelf	12	EA	1,755.00	21,060
Drying rack with shelf, 3' square	6	EA	585.00	3,510
Emergency safety eye wash and shower	3	EA	3,276.00	9,828

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Lab sinks, 2 per lab	12	EA	906.75	10,881
Wall penetration sleeve	2	EA	292.50	585
Lab fixtures and fittings - gas, vacuum, CO2, purified water, etc.	1	LS	55,575.00	55,575
Lab Support Areas				
Lab casework				
Moveable table LB1	10	EA	1,404.00	14,040
Moveable cabinet MC1	13	EA	702.00	9,126
BC1, 3' wide	7	EA	1,111.50	7,781
BC2, 3' wide	10	EA	1,111.50	11,115
BC3, 3' wide	6	EA	1,111.50	6,669
BC5, 30" wide	2	EA	936.00	1,872
BC8, 3' wide	13	EA	1,111.50	14,450
BC9, 30" wide	6	EA	936.00	5,616
KS, 3' wide	8	EA	292.50	2,340
WC1, 3' wide	26	EA	936.00	24,336
WC2, 18" wide	3	EA	468.00	1,404
WC3, 3' wide	34	EA	936.00	31,824
WC4, 18" wide	3	EA	468.00	1,404
WC6, 30" wide	2	EA	783.90	1,568
WC7, 18" wide	1	EA	468.00	468
SB1, 4' wide	3	EA	3,159.00	9,477
SB2, 7'-7-3/8" wide	5	EA	5,850.00	29,250
SB3, 3'-6" wide	1	EA	3,042.00	3,042
WS1, 3'-0" wide	38	EA	263.25	10,004
WS3, 3'-0" wide	13	EA	175.50	2,282
WS6, 3'-0" wide	3	EA	117.00	351
Drying rack with shelf, 3' square	9	EA	585.00	5,265
Sink cabinet CS1	5	EA	380.25	1,901
Flammable cabinet storage, 42" wide x 60" high	3	EA	2,047.50	6,143
Cylinder racks	10	EA	351.00	3,510
Lab sinks	16	EA	906.75	14,508
Environmental rooms	1	LS	244,530.00	244,530
Fume hoods 5', including acid cabinet	6	EA	21,060.00	126,360
Biosafety cabinets	1	EA	12,000.00	12,000
Biosafety cabinets, 4'	5	EA	10,000.00	50,000
IVF down draft table	1	EA	12,000.00	12,000
Open shelving	2	EA	1,500.00	3,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
DEU fridge				*OFOI*
Freezer				*OFOI*
Refrigerator/freezer combo				*OFOI*
Double stack incubator				*OFOI*
Miscellaneous tables	3	EA	3,000.00	9,000
Developing machine				*OFOI*
Sequencing machine				*OFOI*
Black curtain in dark room, allow	1	LS	2,000.00	2,000
Autoclave - small	2	EA	40,365.00	80,730
Protective guards, barriers and bumpers				
Bumper guards, allow	200	LF	29.25	5,850
Corner guards, allow	8	EA	1,170.00	9,360
Prefabricated compartments and accessories				
Toilet partitions				
ADA	2	EA	1,755.00	3,510
Standard	2	EA	1,404.00	2,808
Urinal screens	1	EA	585.00	585
Toilet accessories				
ADA	2	EA	1,170.00	2,340
Standard	2	EA	936.00	1,872
Vanity counters	16	LF	292.50	4,680
Shelving and millwork				
Janitor's shelf and mop rack	1	EA	585.00	585
Hallway alcove shelf	8	LF	175.50	1,404
Food niches adjacent to equipment vestibule doors	3	EA	2,340.00	7,020
Light cove detail - framed gypsum board with sliding glass and wood panels	10	LF	1,170.00	11,700
Hallway niche	8	LF	585.00	4,680
Cabinets and countertops				
Base and wall cabinets				
Base	19	LF	585.00	11,115
Wall	19	LF	351.00	6,669
Cabinetry mockups	1	LS	5,850.00	5,850

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Chalkboards, insignia and graphics				
Signage - *Code & directional only. Room signage by Campus*	17,514	GSF	0.47	8,197
Light control and vision equipment				
Window shading	1	LS	29,250.00	29,250
Projection screen	1	EA	4,095.00	4,095
Tack boards, 6" square at offices	8	EA	29.25	234
Visual display boards	449	SF	23.40	10,507
White boards	108	SF	23.40	2,527
Basement space				
Ventilated cage racks	11	EA	25,000.00	275,000
Vivarium sink	4	EA	906.75	3,627
Aluminum bumper guard rails	164	LF	58.50	9,594
VHP connection port	2	EA	2,340.00	4,680
Pass through box	1	EA	4,680.00	4,680
Emergency eyewashes and showers	1	EA	3,276.00	3,276
Signage	2,315	SF	0.47	1,083
				1,518,043

9. Stairs & Vertical Transportation

No change in scope

				0

10. Plumbing Systems

Sanitary fixtures and local connection piping				
Drinking fountains, dual height	1	EA	5,557.50	5,558

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Institutional fixtures				
Installation and local connection pipework only, supply by others				
Laboratory sinks	28	EA	1,491.75	41,769
Cup sinks, in fume hoods, double	6	EA	1,140.75	6,845
Emergency eyewash and showers	3	EA	1,404.00	4,212
Sanitary waste, vent and service pipework				
Sanitary waste/vent pipework, <= 4"	150	LF	81.90	12,285
Domestic cold water pipework, <= 2"	750	LF	64.35	48,263
Domestic hot water/return pipework, <= 2"	106	LF	58.50	6,201
Valves and specialties	1	LS	4,680.00	4,680
Insulation	106	LF	12.87	1,364
Laboratory and vivarium service equipment				
Reagant grade CO2 lab gas manifold, suitable for eight bottes, CO2 bottles FBO	1	LS	14,040.00	14,040
Water purifiers, room 415B, 455A and 425A, MilliQ Biocel A10	3	EA	11,700.00	35,100
Laboratory and Vivarium service piping, valves and insulation				
Industrial cold water pipework, <= 2"	741	LF	70.20	52,018
Industrial hot water/return pipework, <= 2"	911	LF	64.35	58,623
Deionized water (DI) pipework, Polypro, <= 2"	332	LF	146.25	48,555
Lab Vacuum pipework, <= 2"	1,120	LF	81.90	91,728
Pipe insulation	911	LF	12.87	11,725
Hook-up at lab turrets, LG, LV, and C02	78	EA	292.50	22,815
Valves and specialties	1	LS	6,727.50	6,728
Lab gas (natural gas) pipework, fittings, < = 2"	960	LF	81.90	78,624
Natural Gas valves and specialties	1	LS	690.30	690
Laboratory and vivarium waste and vent				
Laboratory waste/vent pipework, < = 4"	600	LF	111.15	66,690
Condensate drains				
Drainage pipework	240	LF	60.84	14,602
Subcontractor support, plumbing system commissioning	1	LS	7,581.60	7,582

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Test purge and sterilize	30	HRS	140.40	4,212
Equipment hook-up				
Fume hoods 5'	6	EA	3,510.00	21,060
Autoclave - small	2	EA	3,510.00	7,020
CIRM program, portion of basement				
Sanitary fixtures and local connection piping				
Service sinks	1	EA	3,217.50	3,218
Institutional fixtures				
Installation and local connection pipework only, supply by others				
Laboratory sinks	4	EA	1,491.75	5,967
Emergency eyewash and showers	1	EA	1,404.00	1,404
Sanitary waste, vent and service pipework				
Domestic cold water pipework, <= 2"	80	LF	64.35	5,148
Laboratory and Vivarium service piping, valves and insulation				
Industrial cold water pipework, <= 2"	170	LF	70.20	11,934
Industrial hot water/return pipework, <= 2"	210	LF	64.35	13,514
Pipe insulation	210	LF	12.87	2,703
Laboratory and vivarium waste and vent				
Laboratory waste/vent pipework, < = 4"	100	LF	111.15	11,115
				727,988

11. Heating, Ventilation & Air Conditioning

Piping, fittings, valves and insulation				
Chill water supply and return pipework, <= 2"	2,254	LF	76.05	171,417
Heating hot water supply and return pipework, <= 2"	3,114	LF	64.35	200,386
Steam and condensate pipework to autoclaves cage wash areas	120	LF	128.70	15,444
Process cooling supply/return pipework, <= 4"	420	LF	99.45	41,769
Pipe insulation	5,708	LF	14.04	80,140

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Steam piping insulation	120	LF	23.40	2,808
Valves and specialties	1	LS	254,475.00	254,475
Refrigerant pipework, liquid/gas, <= 1"	360	LF	46.80	16,848
Radiant chilling and heating				
Two pipe Trox induction diffusers, active chilled/heated beams	618	LF	409.50	253,071
Radiant base board heater for offices	66	LF	263.25	17,375
Extra cooling capacity room 445E	1	LS	5,850.00	5,850
Air handing equipment				
Fan-coil units, refrigerant, multi-split				
Fan coil units	4	EA	3,510.00	14,040
Condensing units, multiple FCU's	1	EA	43,290.00	43,290
Terminal boxes, supply and exhaust	15	EA	2,047.50	30,713
Slot hood	1	EA	4,095.00	4,095
Air distribution and return				
Galvanized sheet metal supply ductwork	14,250	LB	11.70	166,725
Galvanized sheet metal exhaust ductwork	10,000	LB	11.70	117,000
Specialty fumehood exhaust ductwork, stainless steel, type 316, wet exhaust main and duct riser	5,640	LB	21.06	118,778
Stacks, stainless steel				
Flexible ductwork	645	LF	14.04	9,056
Dampers, volume	136	EA	81.90	11,138
Dampers. smoke/fire	30	EA	1,930.50	57,915
Insulation, supply and vivarium wet exhaust	8,411	SF	4.10	34,443
Diffusers, registers and grilles	31	EA	585.00	18,135
Controls and instrumentation				
Direct digital energy management system	135	PTS	1,696.50	229,028
Laboratory controls, two position, slow reacting in Lab areas, lab supply phoenix valves, and lab exhaust phoenix valves	65	EA	3,100.50	201,533
Credit for direct digital energy management system (shell scope)	1	LS	(11,700.00)	(11,700)

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Test and balance air systems	221	HR	154.44	34,131
Credit for test and balance (shell scope)	1	LS	(3,510.00)	(3,510)
Subcontractor support, HVAC system commissioning	1	LS	46,215.00	46,215
Unit ventilation/exhaust fans				
Labs and offices, dry, incl. redundancy	12,000	CFM	3.51	42,120
General exhaust	673	CFM	1.17	787
Chiller room exhaust	673	CFM	1.17	787
Variable speed drives	1	LS	11,700.00	11,700
CIRM area of basement				
Piping, fittings, valves and insulation				
Heating hot water supply and return pipework, <= 2"	200	LF	64.35	12,870
Air handing equipment				
Duct heaters (RHC)	3	EA	877.50	2,633
Air distribution and return				
Galvanized sheet metal supply ductwork	1,500	LB	11.70	17,550
Galvanized sheet metal exhaust ductwork	2,200	LB	11.70	25,740
Flexible ductwork	60	LF	14.04	842
Dampers, volume	10	EA	81.90	819
Insulation, supply and vivarium wet exhaust	900	SF	4.10	3,686
Diffusers, registers and grilles	10	EA	585.00	5,850
Controls and instrumentation				
Direct digital energy management system	10	PTS	1,696.50	16,965
Laboratory controls, two position, slow reacting in Lab areas, lab supply phoenix valves, and lab exhaust phoenix valves	9	EA	3,100.50	27,905
Credit for direct digital energy management system (shell scope)	1	LS	(585.00)	(585)

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Test and balance air systems	20	HR	154.44	3,089
Credit for test and balance (shell scope)	1	LS	(409.50)	(410)
Subcontractor support, HVAC system commissioning	1	LS	4,387.50	4,388
				2,357,342

12. Electrical Lighting, Power & Communication

Machine and equipment power				
Connections and switches, including conduit and cable				
Mechanical equipment				
Pumps				
DIP-1, 1hp	1	EA	789.75	790
DIRS - 2, 120V/1, 3/4hp	1	EA	789.75	790
SCRP-1, 120V/1, 1/3hp	1	EA	789.75	790
Steam generators				
SG-1A, 480V, 5hp	1	EA	1,521.00	1,521
SG-1B, 120V/1	1	EA	585.00	585
Exhaust fan , 2hp	3	EA	1,170.00	3,510
Fan coil unit FCU -1, -2, 208V/1	5	EA	760.50	3,803
ECU, 208V/3, 1KW	2	EA	819.00	1,638
Fume hood controller power connection CFH, 120V/1	6	EA	877.50	5,265
Biosafety cabinet - 120V/1	6	EA	526.50	3,159
Autoclave - 120V/1	2	EA	555.75	1,112
Airlock including door controls - 120V/1	1	EA	1,755.00	1,755
Water heaters				
RP-WH-1 & RP-WH-2, 120V/1, 1/6hp	2	EA	789.75	1,580
Circulatory pumps, 1/2 hp	1	EA	702.00	702
Lab vacuum pump, 7.5 hp	1	EA	1,170.00	1,170
Drinking fountains	1	EA	526.50	527
Dampers smoke/fire	32	EA	585.00	18,720
AC unit , 208V/1, post doc office	1	EA	526.50	527
AC unit connection	1	EA	1,170.00	1,170

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Env. Room - control panel power connection, 50A, 208/120V	2	EA	702.00	1,404
Env. Room - compressor on roof, power connections	2	EA	1,287.00	2,574
User convenience power				
Panelboard breakers, 120 V - labs	294	EA	93.60	27,518
Panelboard breakers, 120 V - labs support	84	EA	93.60	7,862
Emergency panelboard breakers, 120 V	126	EA	93.60	11,794
Feeder conduit and cable	1,250	LF	44.46	55,575
Wiremold/receptacles, including conduit and cable				
Duplex	16	EA	292.50	4,680
Duplex - above counter	18	EA	292.50	5,265
Duplex - clg	1	EA	310.05	310
Duplex - gfi	20	EA	315.90	6,318
Duplex - wp, gfi	4	EA	409.50	1,638
Duplex - dedicated	14	EA	380.25	5,324
Duplex - flush floor	4	EA	643.50	2,574
Double duplex	76	EA	497.25	37,791
Double duplex - dedicated	22	EA	526.50	11,583
Special receptacle, wall mounted, 30A	22	EA	555.75	12,227
Special receptacle, wall mounted, 30A, gfi	6	EA	567.45	3,405
Rack receptacle power connection	1	EA	585.00	585
Refrigerator outlet	1	EA	409.50	410
Env./cold room control panel power connection	2	EA	585.00	1,170
Surface raceway (AL), stainless steel cover, mounted to the bottom of suspended shelf, (1) channel, including conduit and cables	240	LF	122.85	29,484
Duplex outlet - on surface raceway	120	EA	81.90	9,828
Surface raceway (AL), stainless steel cover, under cabinet (1) channel, wall mounted, including conduit and cables - G2000, gfi	108	LF	99.45	10,741
Duplex outlet - on surface raceway, G2000	48	EA	81.90	3,931
Surface raceway (AL), mounted above table top (1) channel, wall mounted, including conduit and cables	415	LF	105.30	43,700
Duplex outlet - on surface raceway	168	EA	81.90	13,759

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Surface raceway (AL), stainless steel cover, (1) channel, wall mounted above table top, including conduit and cables - gfi	32	LF	105.30	3,370
Duplex outlet - on surface raceway - gfi	52	EA	99.45	5,171
Special outlet, 30A - surface raceway	34	EA	117.00	3,978
Special outlet, 30A, GFI - surface raceway	3	EA	128.70	386
Lighting				
Emergency panelboard breakers, 277 V	42	EA	111.15	4,668
Feeder conduit and cable	225	LF	60.84	13,689
Light fixture and switches including conduit and cables				
Fixture type				
P1A - 8 foot long, pendant mounted, 2-lamp profile, linear fluorescent indirect/direct luminare, program start electronic ballast, dual switching	8	EA	1,053.00	8,424
P1B - 8 foot long, pendant mounted, 3-lamp profile, linear fluorescent indirect/direct luminare, program start electronic ballast, dual switching	2	EA	1,070.55	2,141
P2A - 4 foot long, pendant mounted, 2-lamp profile, linear fluorescent indirect/direct luminare, program start electronic ballast, dual switching	26	EA	585.00	15,210
P2B - 4 foot long, pendant mounted, 3-lamp profile, linear fluorescent indirect/direct luminare, program start electronic ballast, dual switching	36	EA	585.00	21,060
P2B - 8 foot long, pendant mounted, 3-lamp profile, linear fluorescent indirect/direct luminare, program start electronic ballast, dual switching	11	EA	1,053.00	11,583
P6 - pendant mounted compact fluorescent direct/indirect luminare with integral electronic ballast, 1-lamp	26	EA	702.00	18,252
R5 - recessed 2 lamp narrow profile wet location linear fluorescent troffer with program start electronic ballast	4	EA	620.10	2,480
R6 - recessed compact fluorescent wall washer with horizontal lamp and electronic ballast, 1-lamp	2	EA	760.50	1,521

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
R11A - semi-recessed mounted INDIGO (blue) compact fluorescent, direct/indirect luminare, integral electronic ballast, 1-lamp	8	EA	702.00	5,616
R12 - recessed indirect/direct 2 lamp profile 1x4 linear fluorescent troffer, with program electronic ballast	41	EA	643.50	26,384
R16	3	EA	643.50	1,931
S4 - surface mounted 4 foot lamp profile linear fluorescent strip with electronic ballast	4	EA	497.25	1,989
S5A - 2 foot, PLUG IN 1-lamp linear fluorescent under shelf fixture, electronic program ballast, rocker switch	63	EA	555.75	35,012
S5B - 2 foot, HARD WIRED 1-lamp linear fluorescent under shelf fixture, electronic program ballast, rocker switch	8	EA	585.00	4,680
S6 - surface wall mounted 3foot, 1-lamp profile, linear fluorescent strip, program electronic ballast	5	EA	555.75	2,779
S7 - surface wall mounted 4 foot, 1-lamp profile linear fluorescent strip, program start electronic ballast	5	EA	643.50	3,218
S8 - surface side mounted 3 foot, 1-lamp profile linear fluorescent strip, program start electronic ballast	7	EA	526.50	3,686
S10 - LED surface mounted strip , remote driver, integrated in wall	3	EA	877.50	2,633
S13 -	3	EA	585.00	1,755
W2 - 4' long wall mounted 1-lamp profile linear fluorescent indirect/direct luminaire with program start ballast	10	EA	585.00	5,850
W4 - 8' long wall mounted 2-lamp linear fluorescent indirect/direct fixture, program start electronic ballast	2	EA	1,111.50	2,223
W5 - wall mounted exterior IESNA full cutoff metal halide area light fixture, electronic ballast, UL listed for wet location	1	EA	877.50	878
W6 - 4' long wall mounted , 2-lamp profile linear fluorescent indirect fixture, program start electronic ballast	6	EA	702.00	4,212
W6 - 8'				

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
W7 - wall sconce compact fluorescent, integral electronic ballast	2	EA	731.25	1,463
UV ceiling light premium - room 415E	1	LS	1,404.00	1,404
Warning light fixture - " DO NOT ENTER "	1	EA	819.00	819
Dark room light	2	EA	690.30	1,381
Exit sign - surface mounted Edge Lit LED exit sign with battery back-up	5	EA	526.50	2,633
OS1 - ultrasonic occupancy sensor1way	3	EA	526.50	1,580
OS2 - ultrasonic occupancy sensor	8	EA	526.50	4,001
LS - day light sensor	4	EA	526.50	1,895
Timer switch - UV lights	1	EA	468.00	468
Interlock key switch - room 415E	2	EA	585.00	1,170
Slv - low voltage switches	2	EA	438.75	790
Slv,Slv - (2) low voltage switches	12	EA	526.50	6,213
Slv ,TSA, Slv - low voltage, timer, and low voltage switches bank	3	EA	1,170.00	3,510
Slv TSA - low voltage switch, and time switch bank	7	EA	702.00	4,914
SS - switches	27	EA	468.00	12,449
C1, C2, C3, C4 - 5 button low voltage wall box control station	6	EA	702.00	4,212
G1 - GRX3 - graphic eye	1	EA	5,850.00	5,850
Envi. cold room light connection	2	EA	468.00	936
Dimming ballast - allow	86	EA	292.50	25,155
Credit for lighting (shell scope)	1	LS	(40,950.00)	(40,950)
Lighting and power specialties				
Dimmers, dimmer cabinet	1	LS	4,680.00	4,680
Lighting control management server, software,	1	LS	2,340.00	2,340
Surgical table light power connection - 120V/1	1	EA	936.00	936
Projection screen connection - clg	1	EA	760.50	761
Connection in clg - IDF room, 120V/1	1	EA	468.00	468
Motorized window shades	5	EA	702.00	3,159
Motorized blackout shades	4	EA	643.50	2,252
Air shower 458W, 230V	2	EA	672.75	1,346
Relay panel, with (6) relays mounted in ceiling space	8	EA	1,755.00	14,040
Relay panel, with low voltage relays to integrate with occupancy sensors, window shades, time clock with manual override in ceiling space - mini Z panel	8	EA	2,340.00	18,720

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Lab bench circuit timer switch	15	EA	526.50	7,898
Automatic door connection				
Double	1	EA	1,755.00	1,755
Environmental monitoring system conduit only	1	LS	12,870.00	12,870
Equipment alarm monitoring interface	10	EA	936.00	9,360
Environment cold room power connection	3	EA	819.00	2,457
Miscellaneous connections - 120V/1	10	EA	585.00	5,850
Telephone and communications				
Telephone/data outlets, including conduit and cable				
Single wall voice outlet	1	EA	538.20	538
Wall outlet (1) voice, (1) data	87	EA	760.50	66,164
Outlet, service column (1) voice, (2) data	19	EA	877.50	16,497
Dual, outlet, service column (2) voice, (2) data	10	EA	1,111.50	10,670
Floor outlet (1) voice and (2) data	1	EA	1,170.00	1,170
Dual wall (1) voice and (1) data combined with CAT outlet, weather proof	7	EA	877.50	6,143
Data outlet - for environmental control system	16	EA	526.50	8,424
Wall (1) voice outlet - WP	2	EA	643.50	1,287
Data outlet	4	EA	579.15	2,317
Data outlet - clg	1	EA	526.50	527
Wireless access point enclosure and data outlet	13	EA	936.00	12,168
Junction box - 24"x 24" x 8"D, Nema-1	1	EA	292.50	293
MATV, including conduit and cable				
Credit for shell scope	1	LS	(1,170.00)	(1,170)
CAT outlet, combine in data/voce outlet	15	EA	643.50	9,395
Backbone riser cabling - Coax	1	LS	2,340.00	2,340
Audiovisual rough-in	1	LS	4,680.00	4,680
Intercom system - allow	1	LS	1,872.00	1,872
Alarm and security				
Fire alarm systems				
Fire alarm initiating devices connections including conduit and cables				
Horn/strobe	19	EA	702.00	13,338
Strobe	13	EA	760.50	9,887
Fire alarm speakers	13	EA	731.25	9,506
Strobe power supplies	1	EA	819.00	819
Control module	2	EA	819.00	1,638

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Interface module	1	EA	819.00	819
Fire alarm smoke damper connections	32	EA	643.50	20,592
Fire alarm interlock to airlock door control	1	EA	702.00	702
Fire alarm/motorized louver connection	2	EA	643.50	1,287
Environmental room/fire alarm connection	2	EA	643.50	1,287
Fire alarm riser bell connection	2	EA	702.00	1,404
Miscellaneous fire alarm connections - allow	1	LS	3,510.00	3,510
Security, access conduit/rough-in only for :				
Card reader	5	EA	702.00	3,510
Request to exit	4	EA	351.00	1,404
Door strike	5	EA	351.00	1,755
Door contact	5	EA	351.00	1,755
Security, access equipment & cabling.				
Card reader	2	EA	1,755.00	3,510
Request to exit	1	EA	292.50	293
Door strike	1	EA	409.50	410
Door contact	5	EA	351.00	1,755
Security door alarm - time delay	5	EA	351.00	1,755
CCTV camera	4	EA	1,755.00	7,020
CCTV camera - wp	1	EA	2,106.00	2,106
Power supplies	2	EA	1,053.00	2,106
Room 415E door interlock system	1	LS	1,755.00	1,755
Temporary power	4	MO	6,142.50	24,570
Basement				
Machine and equipment power				
Connections and switches, including conduit and cable	1,625	SF	3.51	5,704
User convenience power				
Panelboard breakers, 120V/	84	EA	93.60	7,862
Feeder conduit and cable	120	LF	44.46	5,335
Receptacles, including conduit and cables				
Duplex	19	EA	292.50	5,558
Double duplex - flush floor	6	EA	643.50	3,861
Credit for shell scope	1	LS	(3,510.00)	(3,510)

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Lighting				
Light fixture and controls including conduit and cables				
R1 - recessed 3 lamp profile 2x4 fluorescent troffer with DALI ballast, UL listed for wet location, P65 rating, sealed on all six sides, dual switching, center lamp controlled by low voltage switch, outside lamp on digital timer switch	26	EA	1,336.14	34,740
S2 - surface mounted 3 lamp profile, fluorescent wrap, program start electronic ballast, UL listed for hazardous location, class including group D for ammonia	1	EA	1,755.00	1,755
Exit sign - surface mounted Edge Lit LED exit sign with battery back-up	2	EA	526.50	1,053
Slv - low voltage switches	1	EA	438.75	439
Slv,Slv - (2) low voltage switches	4	EA	526.50	2,106
Credit for shell scope	1	LS	(7,605.00)	(7,605)
Telephone and communications				
Telephone/data outlets, including conduit and cable				
Dual wall (1) voice and (1) data combined with CAT outlet, weather proof	9	EA	877.50	7,898
Alarm and security				
Security, access conduit/rough-in only , allow	1	LS	4,095.00	4,095
Security, access equipment & cabling, allow				
Card reader, conduit only	3	EA	702.00	2,106
Door strike	3	EA	409.50	1,229
Security door alarm - time delay	3	EA	351.00	1,053
Door contact	3	EA	380.25	1,141
Credit for shell scope, security	1	LS	(7,605.00)	(7,605)
				1,033,136

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
13. Fire Protection Systems				
Automatic wet sprinkler system (Fourth floor)	17,514	SF	3.22	56,351
Automatic wet sprinkler system (Basement CIRM area)	1,625	SF	3.22	5,228
				61,580

LEVERAGE FUND CALCULATION		
Leverage Funds:		
total "other" funds from CIB Budget		$ 2,498,500
Adjustments		
Amount budgeted for fees exc struc	$ 858,000	
Construction Amount x 10 percent	$ 866,500	
Amount Admin/design exceeds 10% (deduction)		0
Net Leverage funds		$ 2,498,500
CIRM Funds	$ 8,665,000	
Ratio of Leverage to CIRM Funds		**0.29**
Matching Funds	$ 1,733,000	
Leverage+ match Ratio to CIRM funds		**0.49**
Percentage of Project funded by CIRM	**67.2%**	
Percentage of Project funded by Applicant (after leverage adjustment)	**32.8%**	

DRAWDOWN SCHEDULE FOR RFA 07-03

	entry cells	calc cells

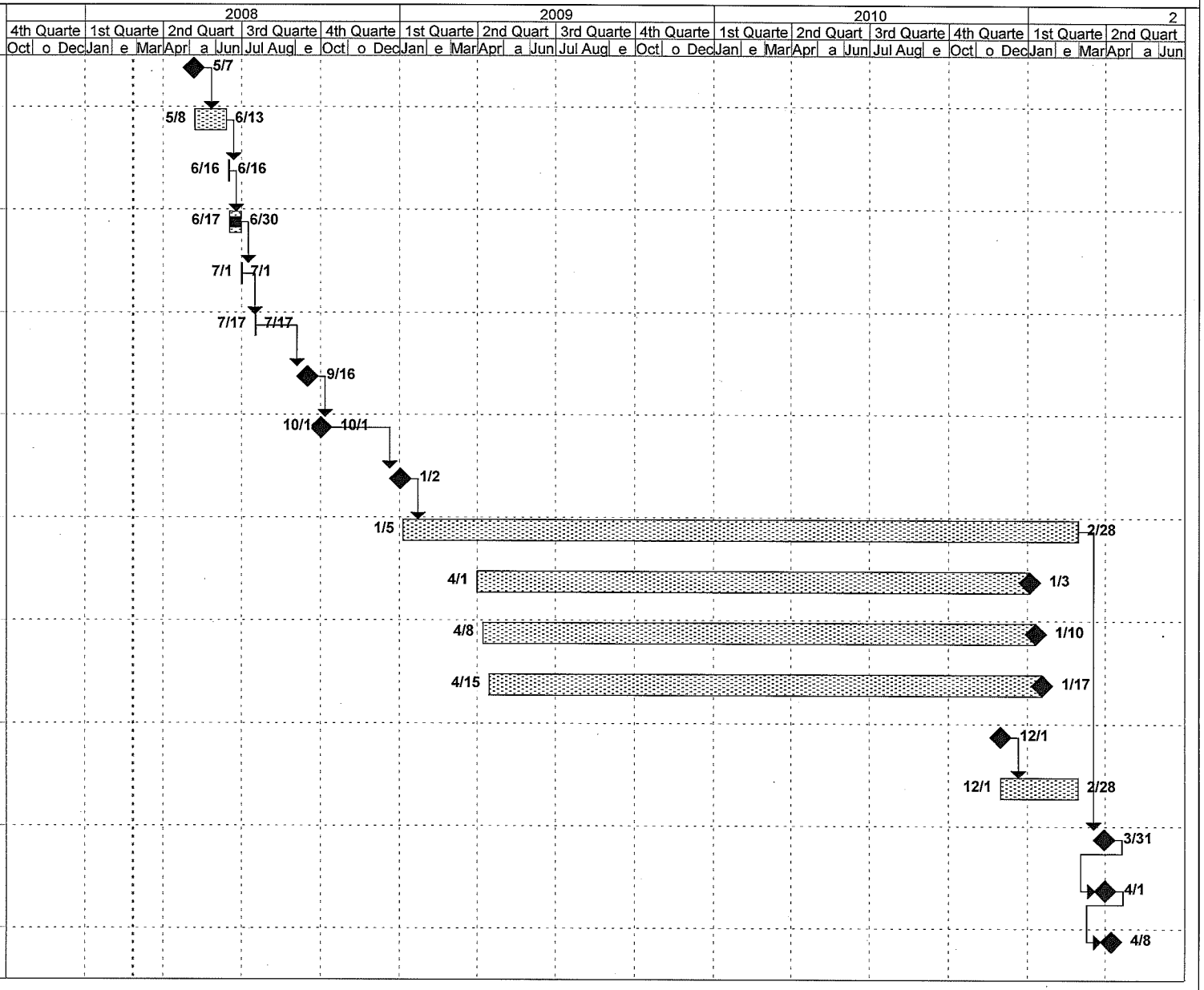
Project Costs	$ 12,896,500	To be spent:	Cirm amount:	$ 8,665,000
Spent to date	$ 35,000		Institutional Amount	$ 4,231,500
Amount to Draw	$ 12,861,500			

Project Award Date 01-Jul-08

	percent draw	Monthly Draw	Cumulative Draw	Monthly CIRM Funds	Cumulative CIRM Funds	Monthly Institutional (match + leverage)	Cumulative Institutional Funds
Spent to Date			$ 35,000				$ 35,000
Jun-08	1%	$ 128,615	$ 163,615	$ -	$ -	$ 128,615	$ 163,615
Jul-08	1%	$ 128,615	$ 292,230	$ -	$ -	$ 128,615	$ 292,230
Aug-08	1%	$ 128,615	$ 420,845	$ -	$ -	$ 128,615	$ 420,845
Sep-08	1%	$ 128,615	$ 549,460	$ -	$ -	$ 128,615	$ 549,460
Oct-08	0%	$ -	$ 549,460	$ -	$ -	$ -	$ 549,460
Nov-08	0%	$ -	$ 549,460	$ -	$ -	$ -	$ 549,460
Dec-08	0%	$ -	$ 549,460	$ -	$ -	$ -	$ 549,460
Jan-09	2%	$ 257,230	$ 806,690	$ -	$ -	$ 257,230	$ 806,690
Feb-09	2%	$ 257,230	$ 1,063,920	$ -	$ -	$ 257,230	$ 1,063,920
Mar-09	2%	$ 257,230	$ 1,321,150	$ -	$ -	$ 257,230	$ 1,321,150
Apr-09	3%	$ 385,845	$ 1,706,995	$ -	$ -	$ 385,845	$ 1,706,995
May-09	4%	$ 514,460	$ 2,221,455	$ -	$ -	$ 514,460	$ 2,221,455
Jun-09	4%	$ 514,460	$ 2,735,915	$ -	$ -	$ 514,460	$ 2,735,915
Jul-09	4%	$ 514,460	$ 3,250,375	$ -	$ -	$ 514,460	$ 3,250,375
Aug-09	4%	$ 514,460	$ 3,764,835	$ -	$ -	$ 514,460	$ 3,764,835
Sep-09	4%	$ 514,460	$ 4,279,295	$ 47,795	$ 47,795	$ 466,665	$ 4,231,500
Oct-09	4%	$ 514,460	$ 4,793,755	$ 514,460	$ 562,255	$ -	$ 4,231,500
Nov-09	5%	$ 643,075	$ 5,436,830	$ 643,075	$ 1,205,330	$ -	$ 4,231,500
Dec-09	5%	$ 643,075	$ 6,079,905	$ 643,075	$ 1,848,405	$ -	$ 4,231,500
Jan-10	5%	$ 643,075	$ 6,722,980	$ 643,075	$ 2,491,480	$ -	$ 4,231,500
Feb-10	5%	$ 643,075	$ 7,366,055	$ 643,075	$ 3,134,555	$ -	$ 4,231,500
Mar-10	5%	$ 643,075	$ 8,009,130	$ 643,075	$ 3,777,630	$ -	$ 4,231,500
Apr-10	5%	$ 643,075	$ 8,652,205	$ 643,075	$ 4,420,705	$ -	$ 4,231,500
May-10	4%	$ 514,460	$ 9,166,665	$ 514,460	$ 4,935,165	$ -	$ 4,231,500
Jun-10	4%	$ 514,460	$ 9,681,125	$ 514,460	$ 5,449,625	$ -	$ 4,231,500
Jul-10	4%	$ 514,460	$ 10,195,585	$ 514,460	$ 5,964,085	$ -	$ 4,231,500
Aug-10	4%	$ 514,460	$ 10,710,045	$ 514,460	$ 6,478,545	$ -	$ 4,231,500
Sep-10	4%	$ 514,460	$ 11,224,505	$ 514,460	$ 6,993,005	$ -	$ 4,231,500
Oct-10	4%	$ 514,460	$ 11,738,965	$ 514,460	$ 7,507,465	$ -	$ 4,231,500
Nov-10	4%	$ 514,460	$ 12,253,425	$ 514,460	$ 8,021,925	$ -	$ 4,231,500
Dec-10	2%	$ 257,230	$ 12,510,655	$ 257,230	$ 8,279,155	$ -	$ 4,231,500
Jan-11	2%	$ 257,230	$ 12,767,885	$ 257,230	$ 8,536,385	$ -	$ 4,231,500
Feb-11	1%	$ 128,615	$ 12,896,500	$ 128,615	$ 8,665,000	$ -	$ 4,231,500
Mar-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Apr-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
May-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Jun-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Jul-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Aug-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Sep-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Oct-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
Nov-11		$ -	$ 12,896,500	$ -	$ 8,665,000	$ -	$ 4,231,500
	100%	$ 12,861,500		$ 8,665,000		$ 4,196,500	

CIRM MAJOR FACILITIES SCHEDULE

Mon 2/25/08



ID		Task Name
1		**ICOC decision on Grant**
2		Prepare Grant support information
3		Submit Grant support info to CIRM
4	✓	CIRM prepares Notice of Grant Award
5		Applicant signs NGA
6		Project funding approval
7		Regents CEQA action (if necessary)
8		Advertise for construction contract
9		Award Construction contract
10		Construction Activities
11		Prepare Quarterly Funding requests to CIRM
12		Submit funding requests to CIRM (90%)
13		CIRM issues payments up to 90 percent
14		Beneficial Occupancy
15		Equipment installation
16		Notice of Completion
17		Request construction completion amount
18		CIRM issues final payment (10%)

Project: RFA 07-03 Project Schedule
Application: #FA 1-00617-1
Date: Mon 2/25/08

Task	Summary	Rolled Up Progress	Project Summary		
Progress	Rolled Up Task	Split	Group By Summary		
Milestone	Rolled Up Milestone	External Tasks	Deadline		

UNIVERSITY OF CALIFORNIA SANTA CRUZ
BIOMEDICAL SCIENCES FACILITY - CIRM LABORATORY

EHDD PROJECT # 06013

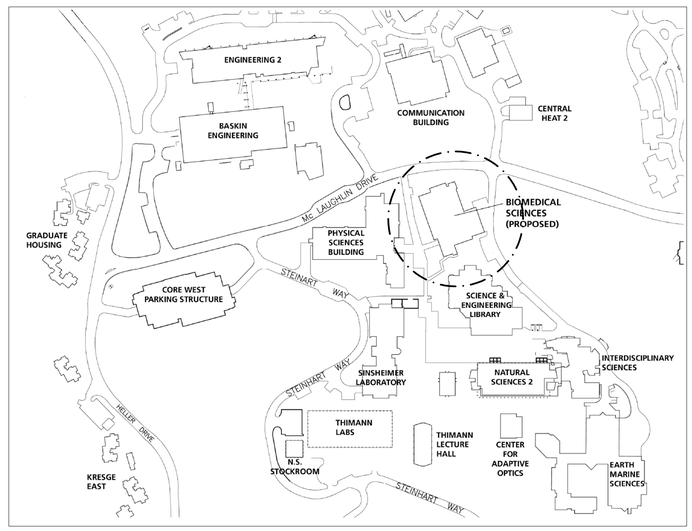
UCSC PROJECT # 6701

GRANT SKETCH PLANS
FEBRUARY 20, 2008

INDEX OF DRAWINGS

GENERAL

ARCHITECTURAL



SITE MAP

Biomedical Sciences Facility CIRM Laboratory
University of California, Santa Cruz

EHDD
Esherick Homsey Dodge & Davis

Architecture
Interior Design
Graphic Design

500 Treat Avenue
San Francisco
California 94110
arch@ehdd.com
415.285.3866 fax
415.285.9193

Consultant

Stamp

Printing	Date
GRANT SKETCH PLANS	FEB 20, 2008

Revisions	Date

Scale
NONE

Drawn by
EHDD

EHDD Job Number
06013

UCSC Job Number
6701

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1/4"=1'-0"
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EHDD Job Number
06013
UCSC Job Number
6701
Sheet Title

CIRM LAB BASEMENT PLAN NORTH

Sheet Number

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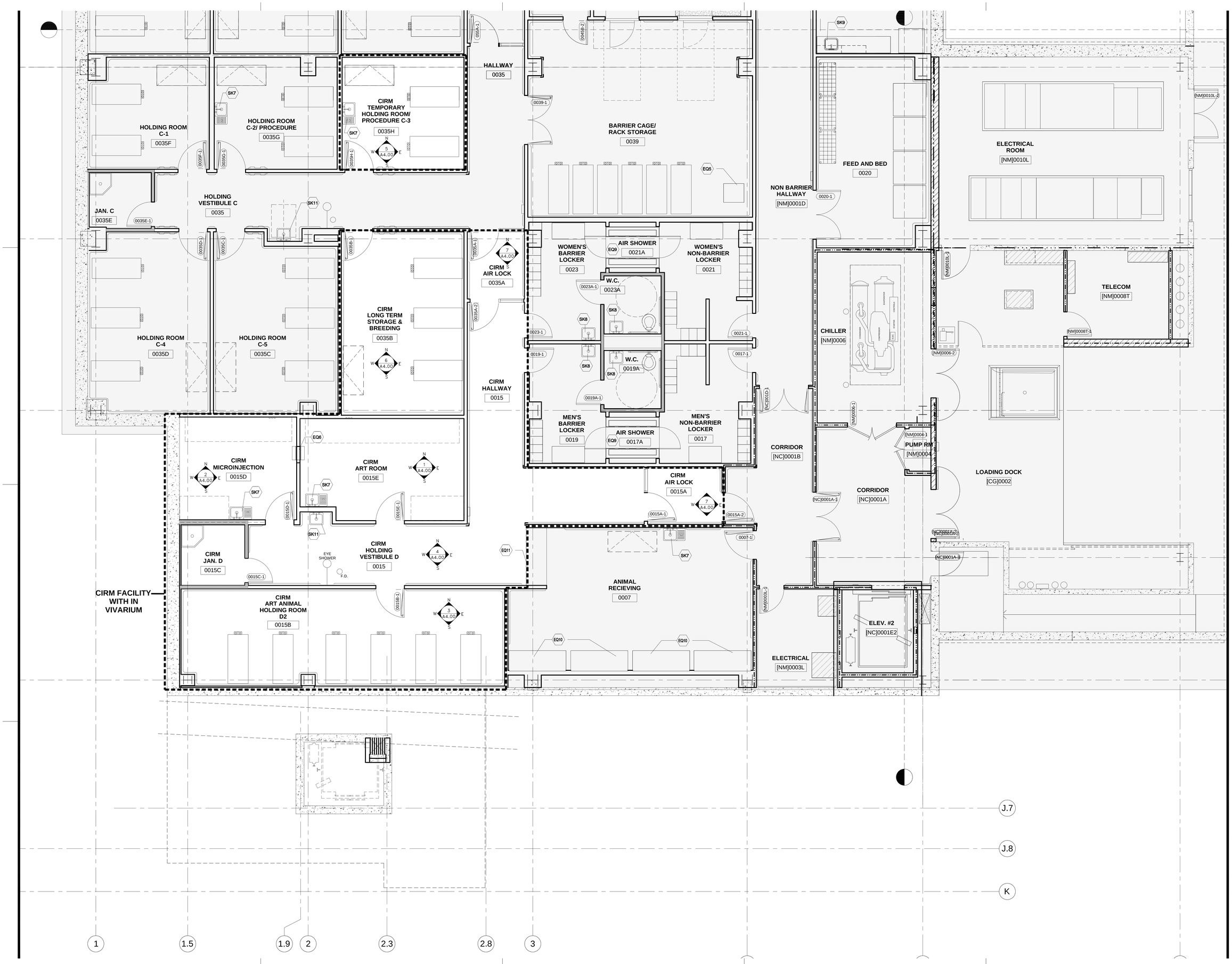

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6701
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CIRM LAB BASEMENT PLAN SOUTH

Sheet Number

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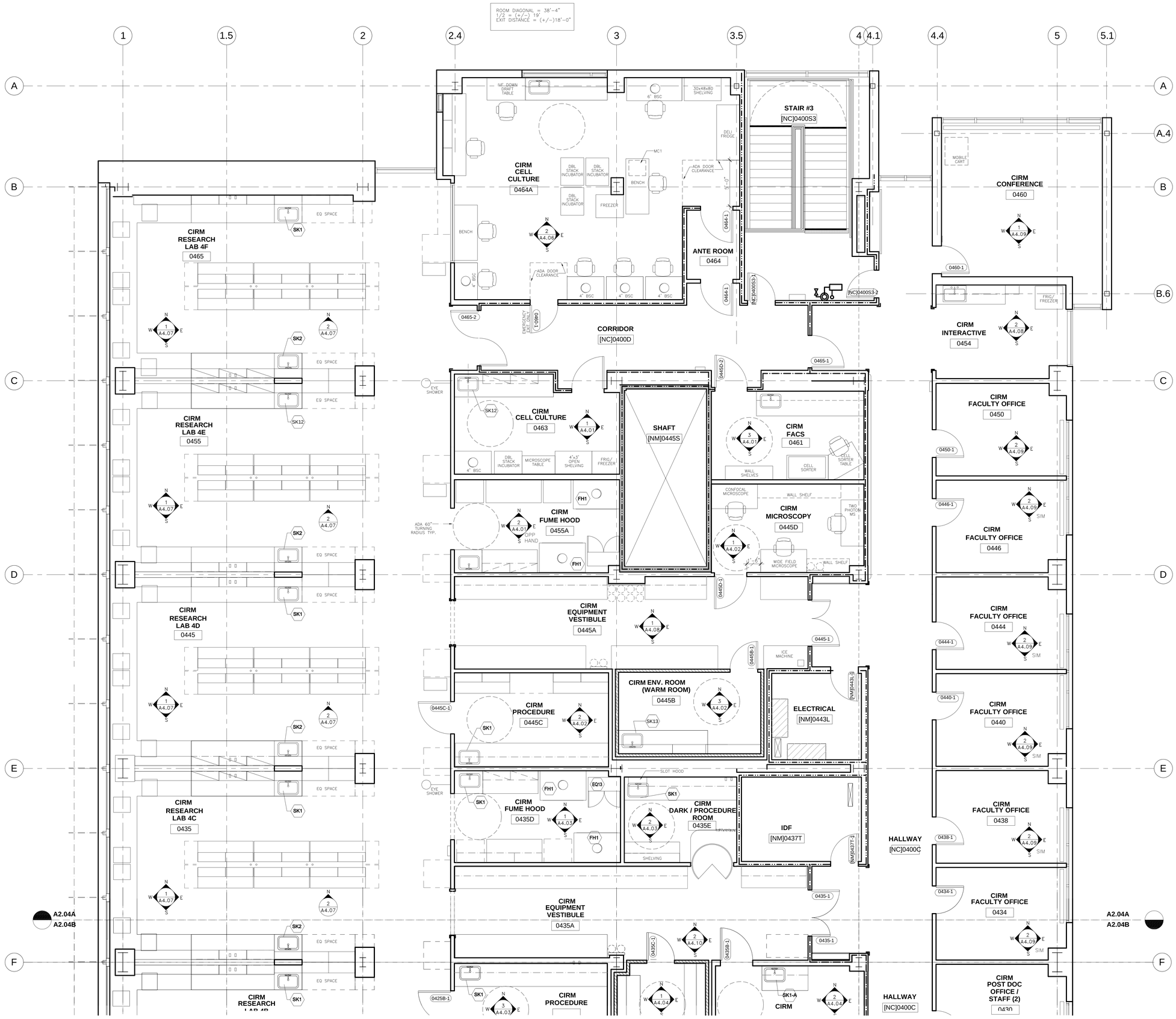

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Drawn by

EHDD Job Number
06013

UCSC Job Number
6701

Sheet Title
CIRM LAB PLAN NORTH

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A2.04A
A2.04B

CIRM RESEARCH LAB 4B
0425

CIRM RESEARCH LAB 4A
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CIRM EQUIPMENT VESTIBULE
0435A

CIRM PROCEDURE
0425B

CIRM FUME HOOD
0425A

CIRM ENV. ROOM (COLD ROOM)
0435C

CIRM ELECTRO PHYSIOLOGY FACILITY
0435B

CIRM EQUIPMENT VESTIBULE
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CIRM DARK ROOM
0415D

CIRM SQUENCING CENTER 1
0415E

CIRM SEQUENCING CENTER 2
0415C

SHAFT
[NM]0415S

CIRM AUTOCLAVE
0415B

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SHAFT
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CIRM OFC SERVICE
0401

CONTROL ROOM
[NM]0402

JAN
[NJ]0403

WOMEN
[NT]0405

MEN
[NT]0407

HALLWAY
[NC]0400A

HALLWAY
[NC]0400C

HALLWAY
[NC]0400B

HALLWAY
[NC]0400E

STAIR #2
[NC]0400S2

ELEV. #1
[NC]0400E1

ELEV. #2
[NC]0400E2

FACULTY OFFICE
0434

CIRM POST DOC OFFICE / STAFF (2)
0430

CIRM STAFF (2) OFFICE
0420

CIRM INTERACTIVE
0416

CIRM POST DOC OFFICE (4)
0412

CIRM STORAGE
0410

CONTROL
[NM]0408

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A2.04B

F
G
H
J
J.7
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5

Biomedical Sciences Facility CIRM Laboratory

University of California, Santa Cruz

EHDD

Esherick Homsey Dodge & Davis

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Interior Design
Graphic Design

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1/4"=1'-0"

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EHDD Job Number
06013

UCSC Job Number
6701

Sheet Title
CIRM LAB PLAN SOUTH

Sheet Number
A2.04B

EQUIPMENT LEGEND

NUM	DESCRIPTION	FURNISHED BY
EQ1	SMALL AUTOCLAVE CABINET - ENCLOSED SINGLE DOOR	CFCI
EQ2	GLASSWARE WASHER	CFCI
EQ3	CAGE RACK WASHER	CFCI
EQ4	MEDIUM AUTOCLAVE - PASS THRU D.DOOR - RECESSED 2 WALLS	CFCI
EQ5	WATER POUCH MACHINE	OFOI
EQ6	PASS-THRU BOX	CFCI
EQ7	NECROPSY TABLE	CFCI
EQ8	VHP BIO-DECONTAMINATION SYSTEM	OFOI
EQ9	AIR SHOWER	CFCI
EQ10	ISOLATION CUBICLE - DOUBLE SIDE	CFCI
EQ11	ISOLATION CUBICLE - SINGLE SIDE	CFCI
EQ12	SURGERY TABLE	CFCI
EQ13	TALL FLAMMABLE STORAGE CABINET	CFCI
EQ14	MOBILE FLAMMABLE STORAGE CABINET	CFCI
EQ15	TALL FLAMMABLE STORAGE CABINET	CFCI

FUME HOOD LEGEND

FH1	STANDARD FUME HOOD	CFCI
FH2	ADA ACCESSIBLE FUME HOOD	CFCI
FH3	ADA ACCESSIBLE FUME HOOD	CFCI
BSC1	CLASS II - TYPE B2 - 100% EXHAUSTED	CFCI
BSC2	CLASS II - TYPE BA - NO EXTERNAL EXHAUST	CFCI

SINK LEGEND

SK1	EPOXY RESIN SINK 24L x 15W x 12D	CFCI
SK1A	EPOXY RESIN SINK 24L x 15W x 12D COLD WATER ONLY	CFCI
SK2	EPOXY RESIN SINK 24L x 15W x 18D	CFCI
SK3	316L S.S. SINK 24L x 15W x 12D	CFCI
SK4	316L S.S. SINK 30L x 24W x 18D DBL. BOWL W/ INT. TOP, LEGS, BKSPLSH *(1 BOWL 5D)*	CFCI
SK5	316L S.S. SINK 30L x 24W x 18D W/ INTEGRAL TOP, LEGS, BKSPLSH	CFCI
SK6	316L S.S. SINK 18L x 15W x 12D	CFCI
SK7	316L S.S. SINK 15L x 12W x 10D W/ INT. SIDE BOARD, SINK @ LEFT	CFCI
SK8	316L S.S. SINK 15L x 12W x 10D W/ INT. SIDE BOARD, SINK @ LEFT	CFCI
SK9	304 S.S. SINK 18L x 15W x 12D	CFCI
SK10	316L S.S. SINK 30L x 24W x 18D DBL BOWL W/ INT. TOP, LEGS, BKSPLSH	CFCI
SK11	316L S.S. SINK 15L x 12W x 10D	CFCI
SK12	EPOXY RESIN SINK 25L x 15W x 5D	CFCI
SK13	316L S.S. SINK 24L x 15W x 5D	CFCI
SK14	316L S.S. SINK 30L x 24W x 5D W/ INTEGRAL TOP, LEGS, BKSPLSH	CFCI

EQUIPMENT SYMBOLS:	
A.T.S.	ANIMAL TRANSFER STATION. O.F.O.I.
	S.S. WIRE SHELVING O.F.O.I.
A.C.R.	VENTILATED ANIMAL CAGE RACK. C.F.C.I.
	PHENOLIC RESIN LOCKERS C.F.C.I.
	METAL BUMPER GUARDS C.F.C.I.
S	EMERGENCY EYE WASH SHOWER C.F.C.I.
	VHP SUPPLY & RETURN PORT C.F.C.I.
EQ SPACE	CLEAR SPACE FOR FUTURE SCIENTIFIC EQUIPMENT N.I.C.
	FLUSH CONTROL VALVE BOX SEE PLUMBING DWGS

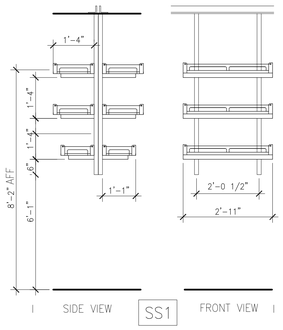
EQUIPMENT NOTES: (PV) = PRE-VACUUM

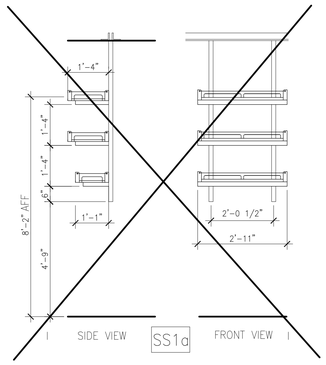
DESCRIPTION: SEE INTERIOR ELEVATIONS FOR BACKER PLATE LOCATIONS

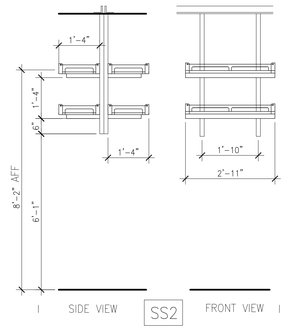
CASEWORK SCHEDULE

SEE A9.51 FOR DETAIL

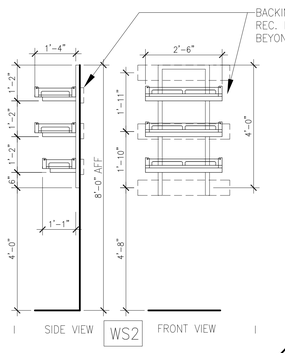
SHELVES (CEILING MOUNTED)

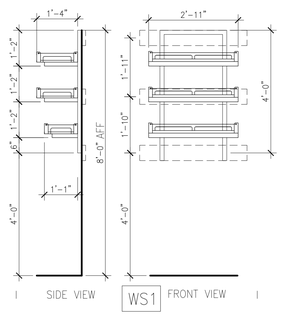


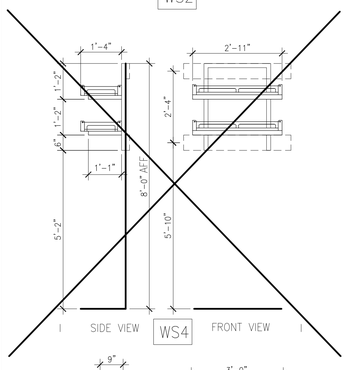


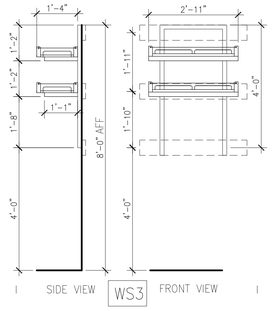


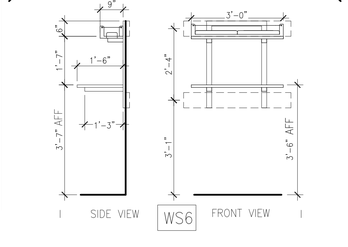
SHELVES (WALL MOUNTED)

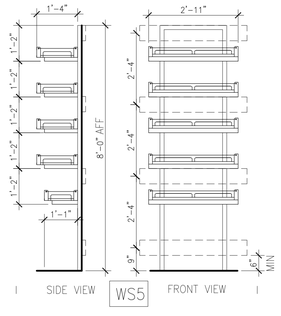








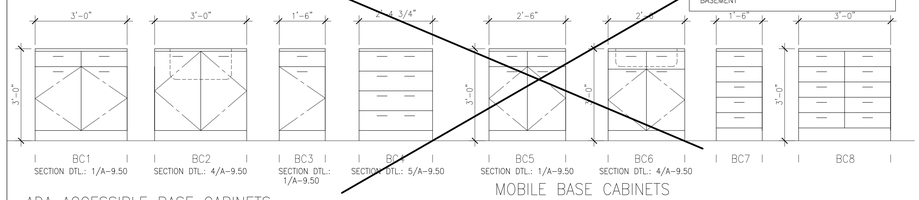




GENERAL NOTE:

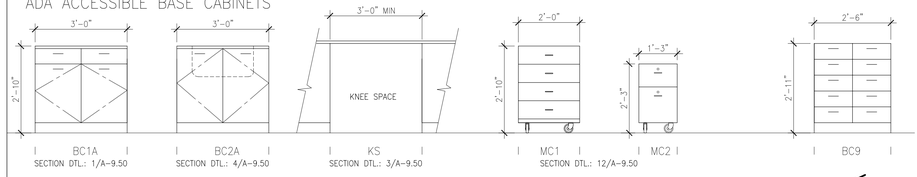
ALL BASEMENT CASEWORK TO BE CONSTRUCTED OF OF PHENOLIC RESIN UNLESS NOTED TO BE S.S. THERE SHALL BE NO WOOD IN THE BASEMENT

BASE CABINETS

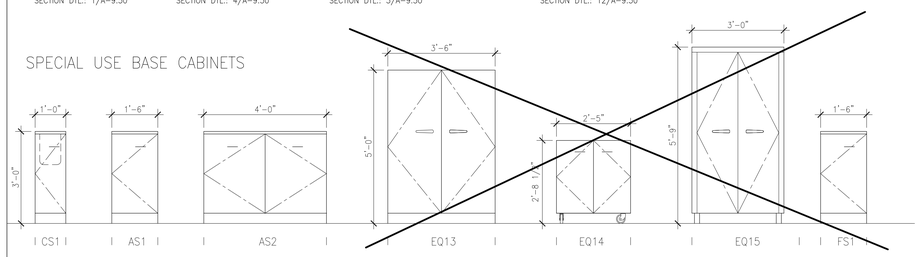


ADA ACCESSIBLE BASE CABINETS

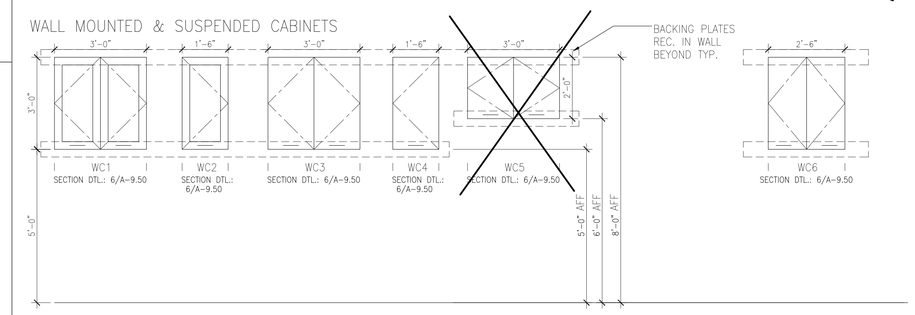
MOBILE BASE CABINETS



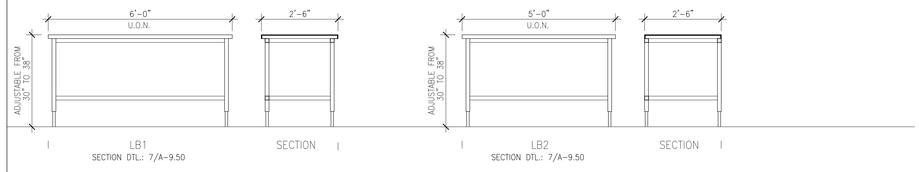
SPECIAL USE BASE CABINETS



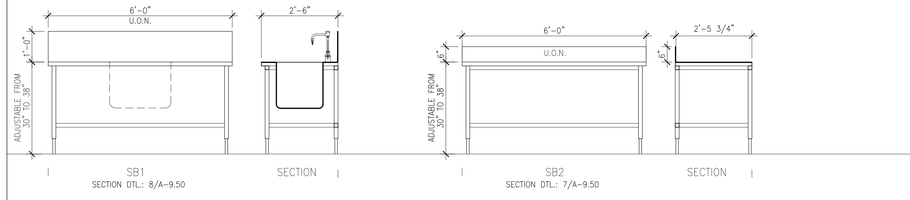
WALL MOUNTED & SUSPENDED CABINETS



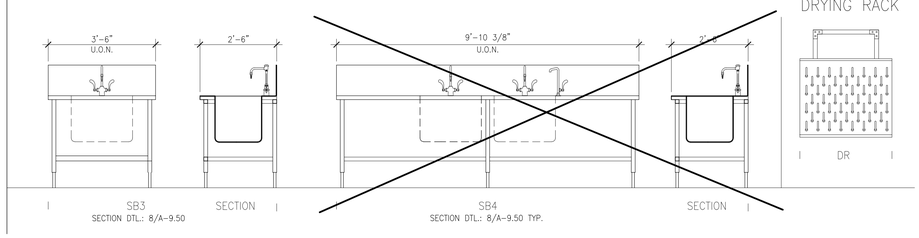
MOBILE LAB BENCH



S.S BENCH



DRYING RACK



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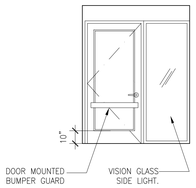
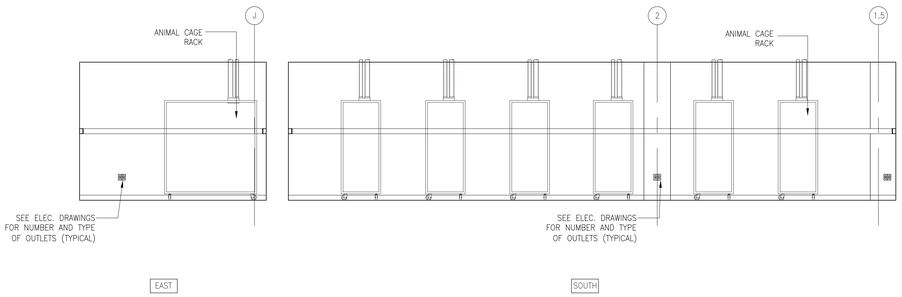
CIRM LAB EQUIP. LEGEND

Sheet Number
A3.00



8 A4.00 **TYPICAL AIR LOCK DOOR**
1/4"=1'-0"



7 A4.00 **NOT USED**
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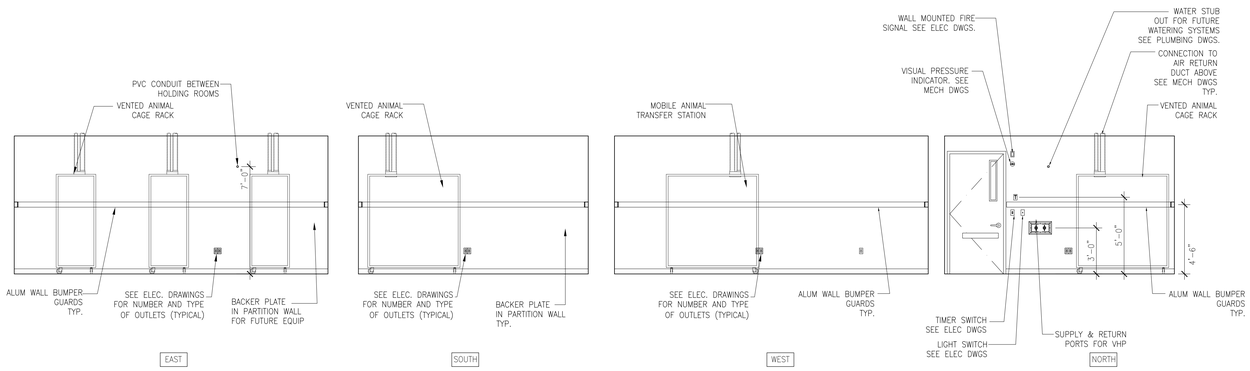
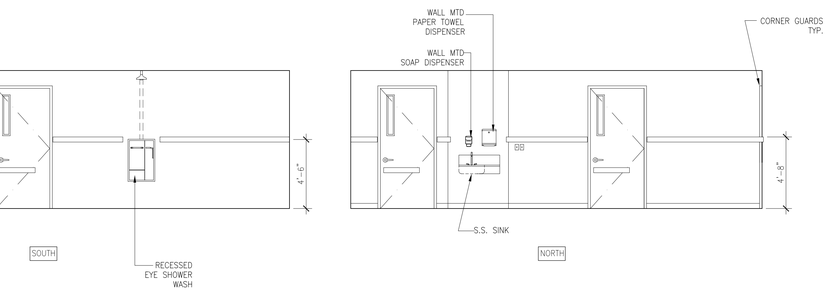
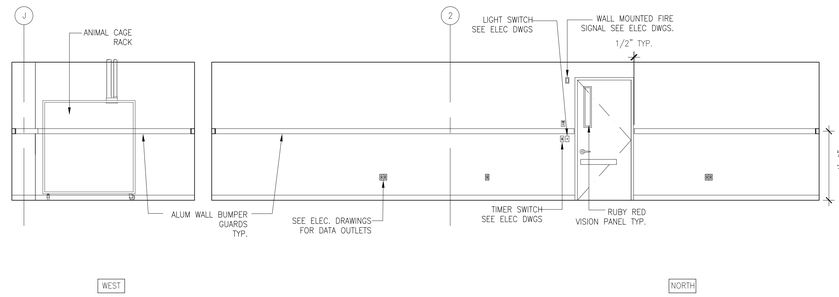


6 A4.00 **CIRM LONG TERM STORAGE & BREEDING RM 0035B**
1/4"=1'-0"

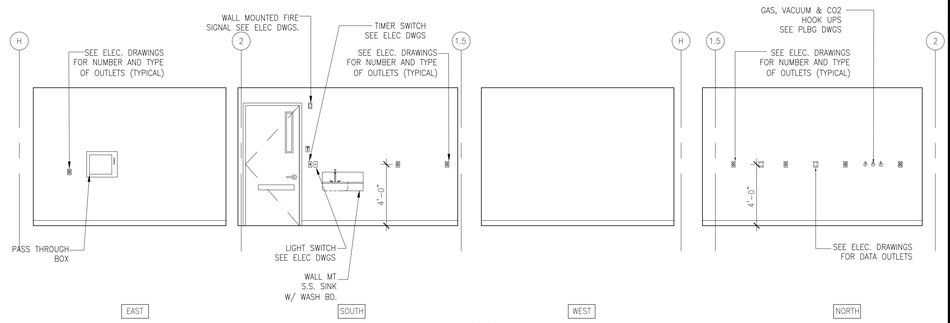
5 A4.00 **CIRM TEMPORARY HOLDING / PROCEDURE RM 0035H**
1/4"=1'-0"



4 A4.00 **CIRM HOLDING VESTIBULE D RM 00015**
1/4"=1'-0"



3 A4.00 **CIRM ART ANIMAL HOLDING ROOM D2 RM 0015B**
1/4"=1'-0"



2 A4.00 **CIRM MICRO INJECTION RM 0015D**
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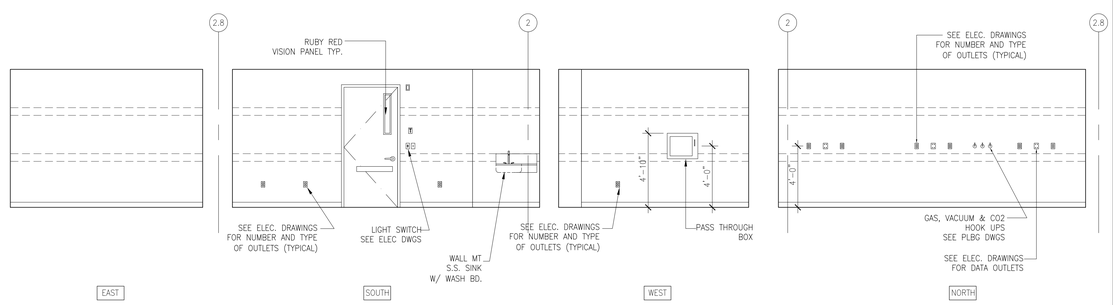

1 A4.00 **CIRM A.R.T. RM 0015E**
1/4"=1'-0"

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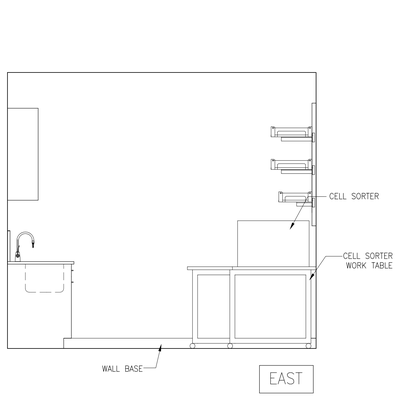
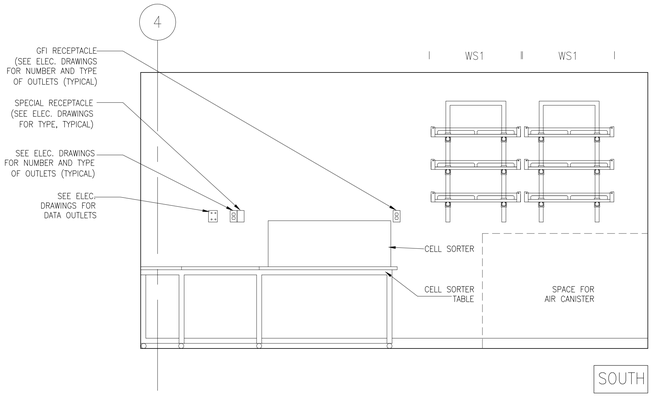
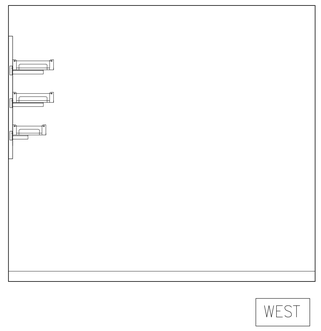
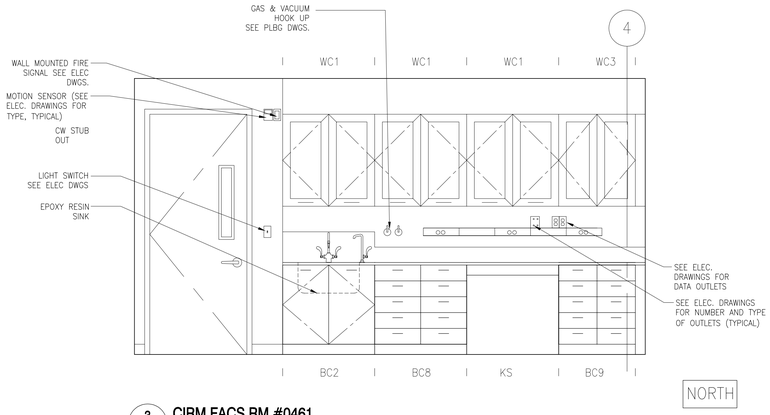
A4.00









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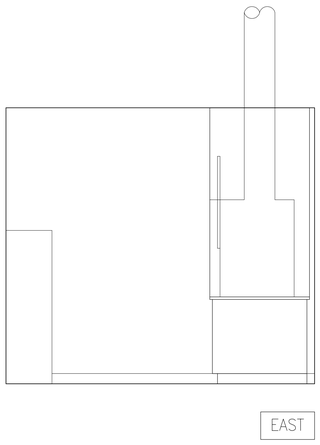

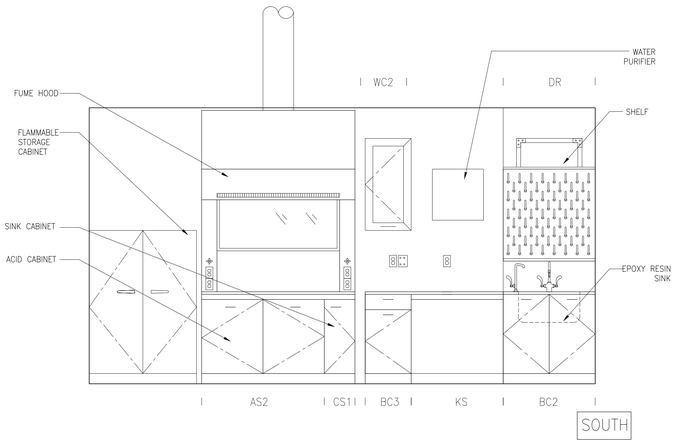

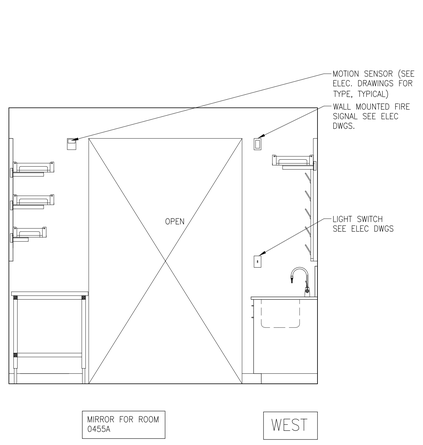

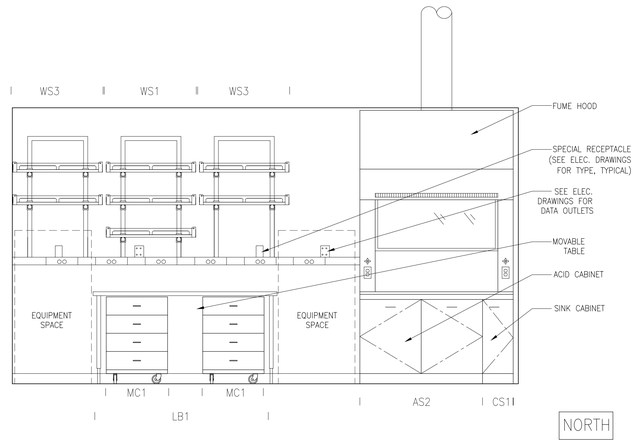

2 A4.01 **CIRM FUME HOOD RM# 0425A, 0455A(MIRROR)**
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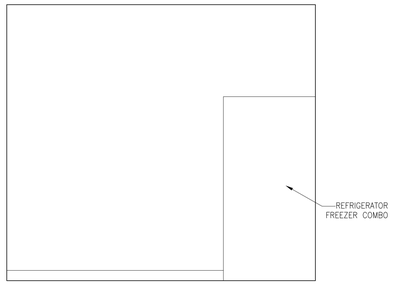

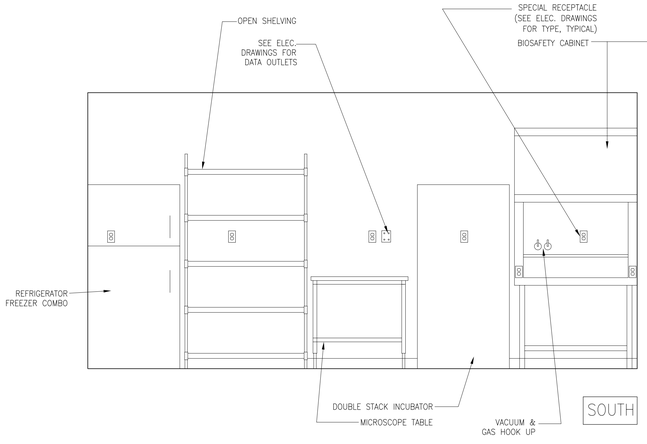

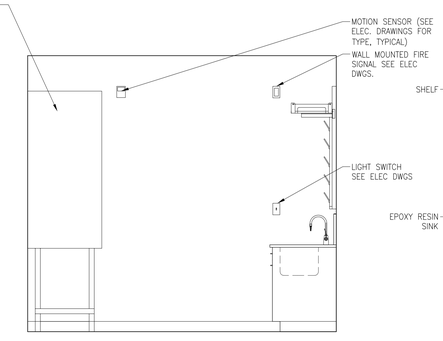

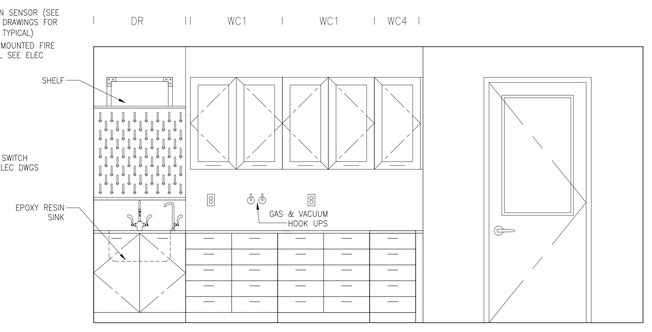

1 A4.01 **CIRM CELL CULTURE RM #0463**
1/2"=1'-0"

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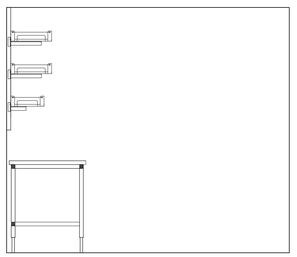

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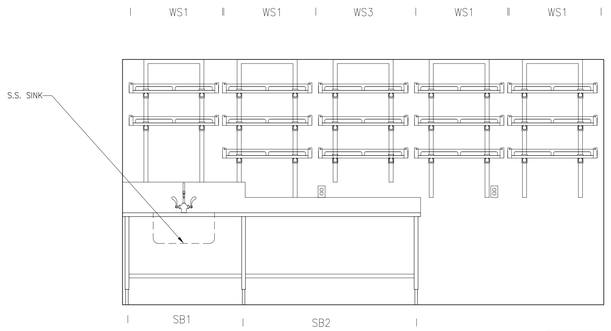

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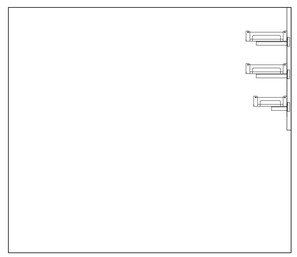

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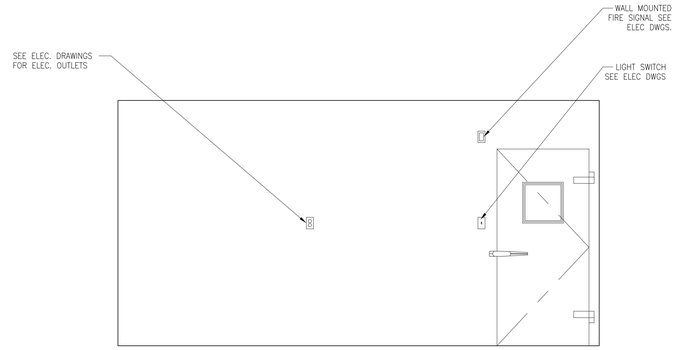

NORTH

3 A4.02 **CIRM ENVIRONMENTAL WARM ROOM RM#0445B**
1/2"=1'-0"

EAST

SOUTH

WEST

NORTH

2 A4.02 **CIRM PROCEDURE RM#0445C**
1/2"=1'-0"

EAST

SOUTH

WEST

NORTH

1 A4.02 **CIRM MICROSCOPY RM #0445D**
1/2"=1'-0"

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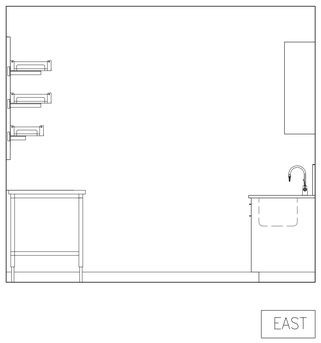
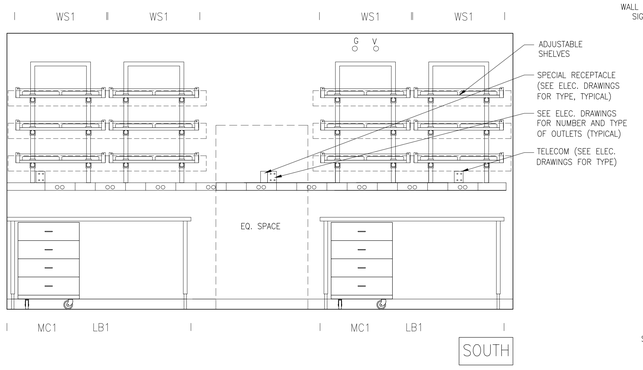
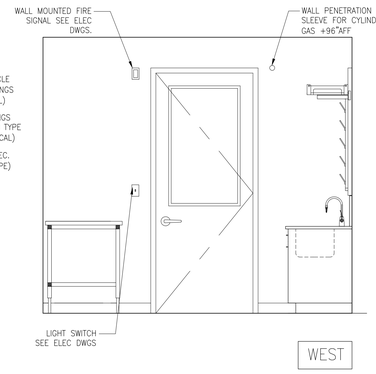
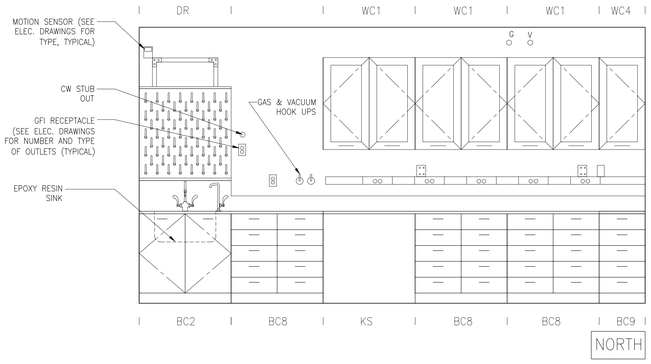
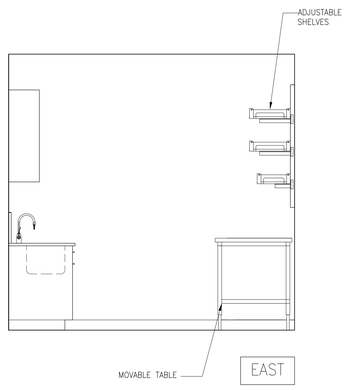


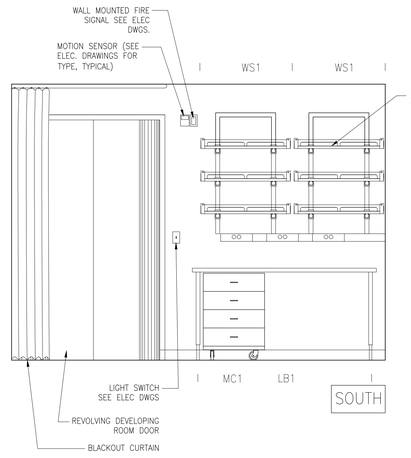


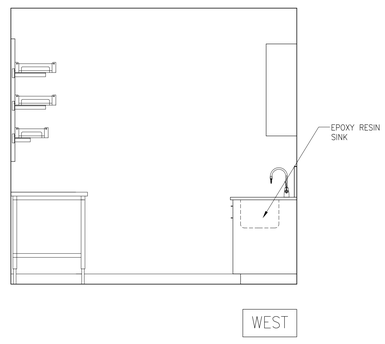


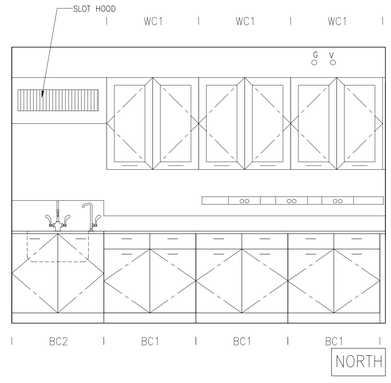


3 A4.03 CIRM PROCEDURE RM#0425B
1/2"=1'-0"









2 A4.03 CIRM DARK / PROCEDURE RM# 0435E
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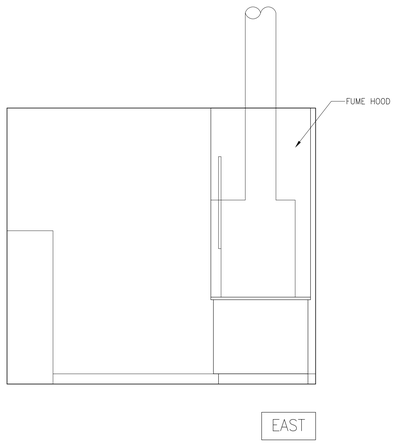

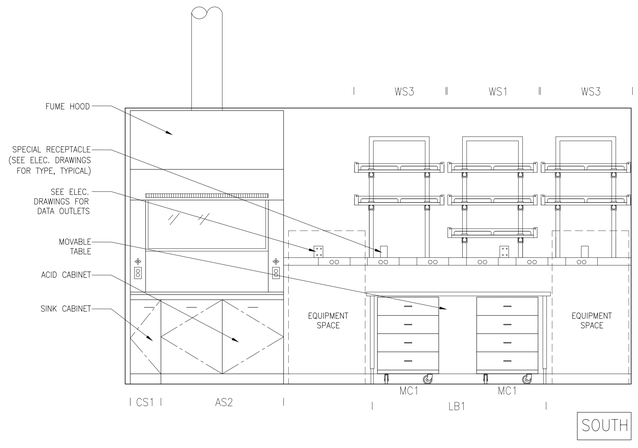

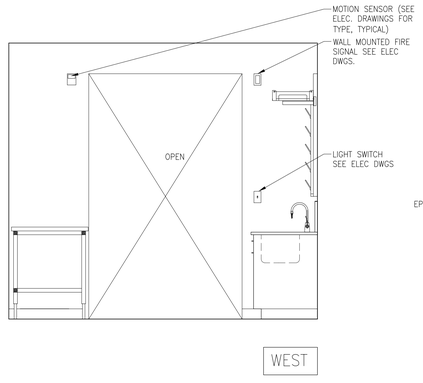

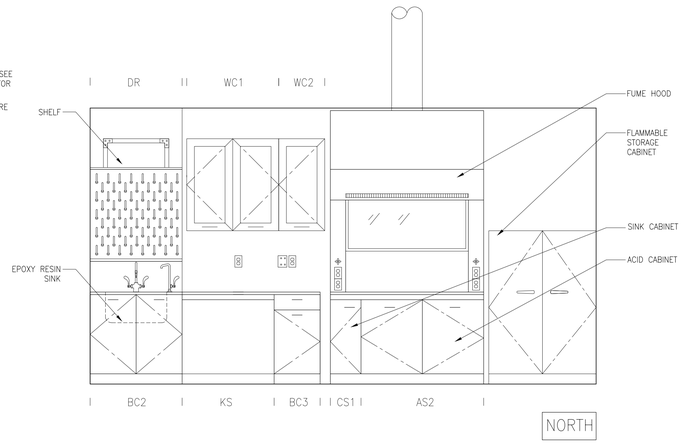

1 A4.03 CIRM FUME HOOD RM #0435D
1/2"=1'-0"

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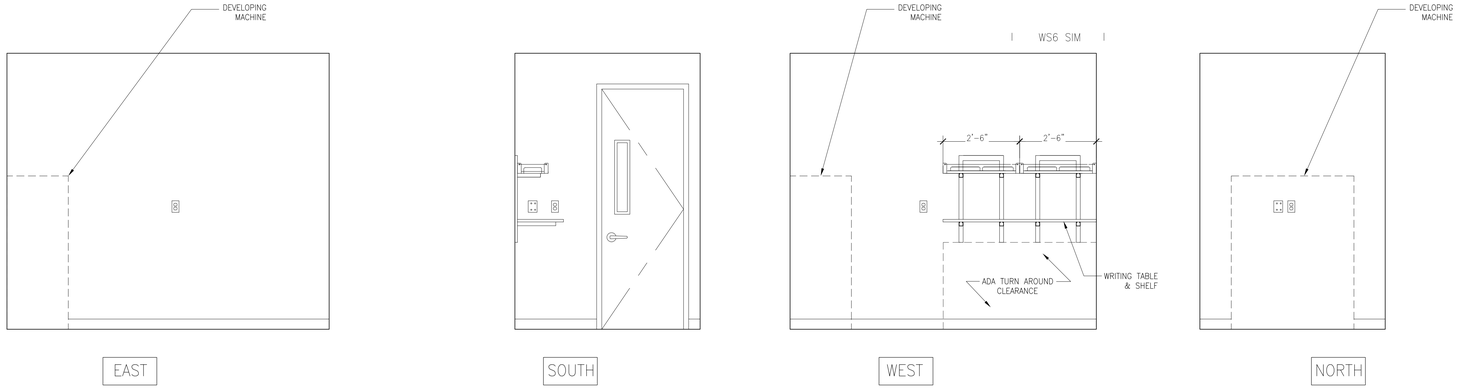
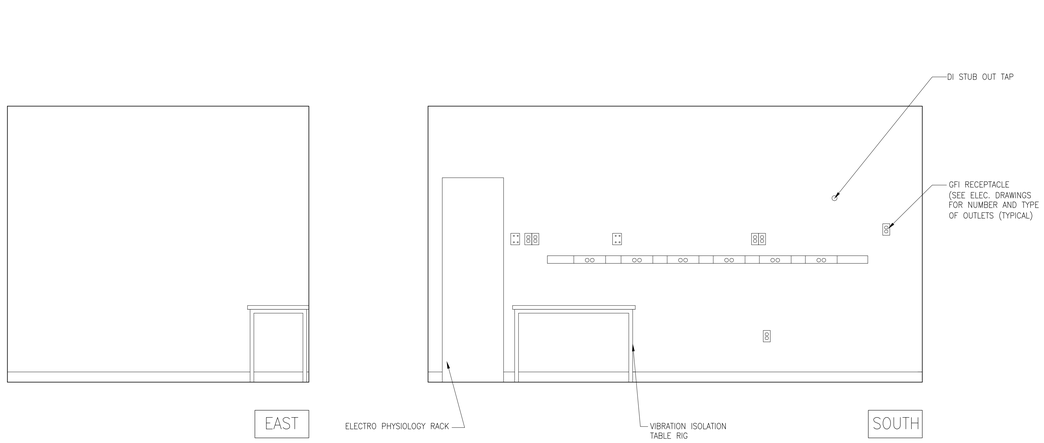


3 A4.04 CIRM DARK / PROCEDURE ROOMRM# 0415D
1/2"=1'-0"



2 A4.04 CIRM ELECTRO PHYSIOLOGY FACILITY RM# 0435B
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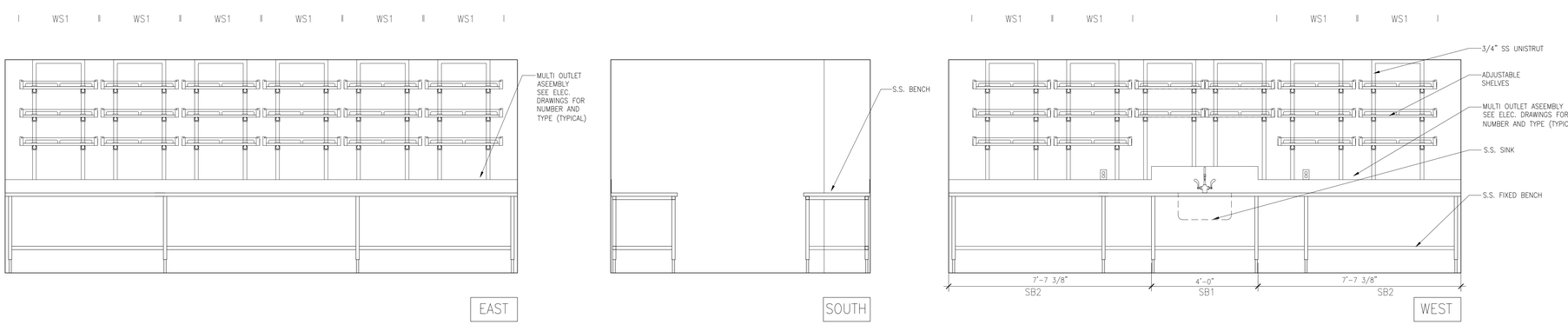

1 A4.04 CIRM ENVIRONMENTAL COLD ROOM - RM# 0435C
1/2"=1'-0"

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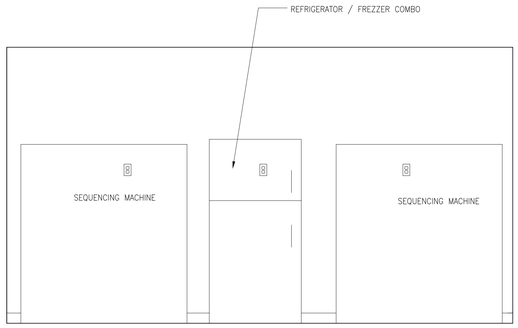
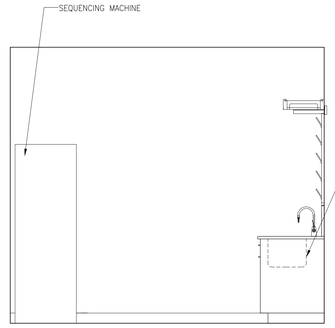
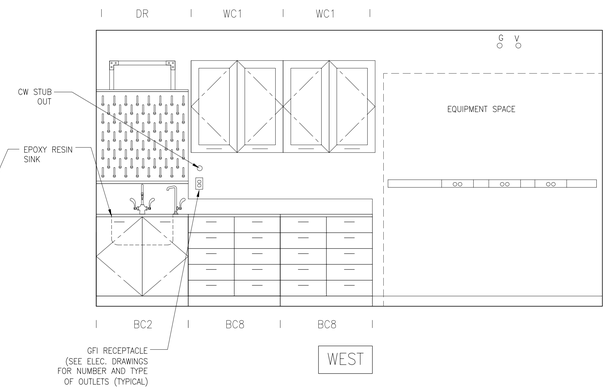
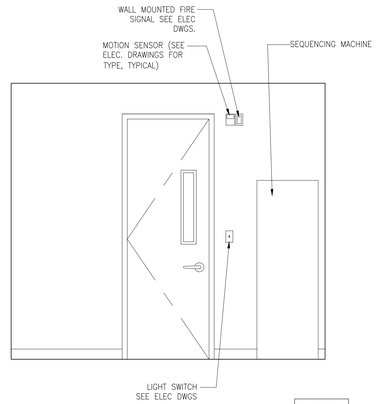
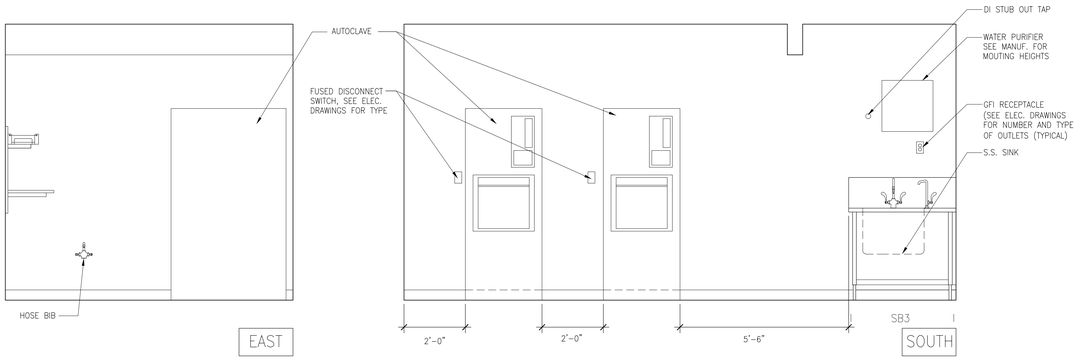


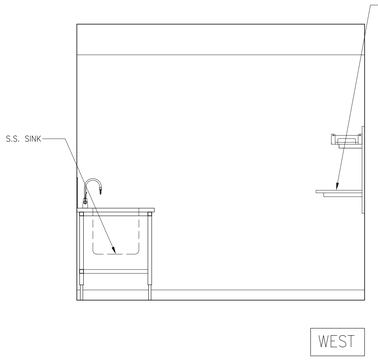


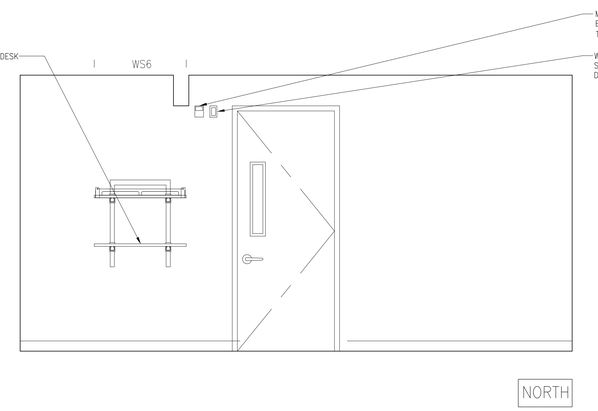




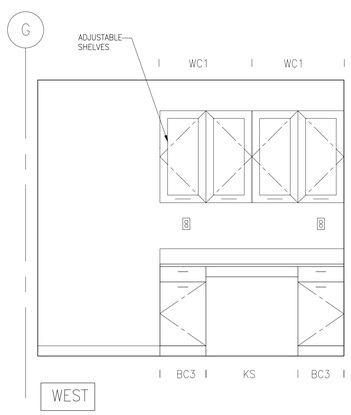
3 A4.05 **CIRM SEQUENCING CENTER 2 RM# 0415C**
1/2"=1'-0"

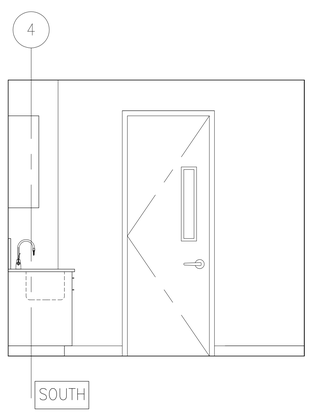


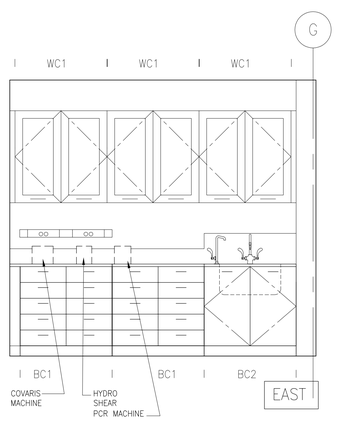


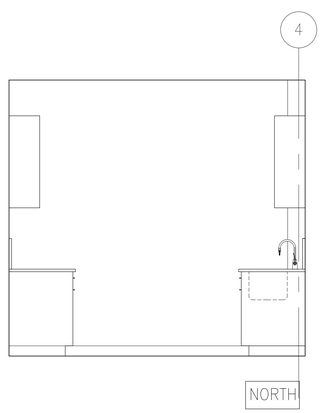


2 A4.05 **CIRM AUTOCLAVE RM# 0415B**
1/2"=1'-0"









1 A4.05 **CIRM SEQUENCING CENTER RM# 0415E**
1/2"=1'-0"

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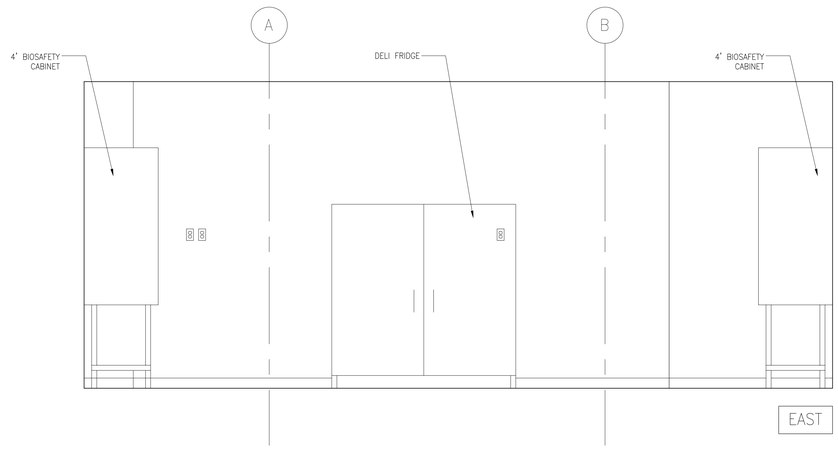

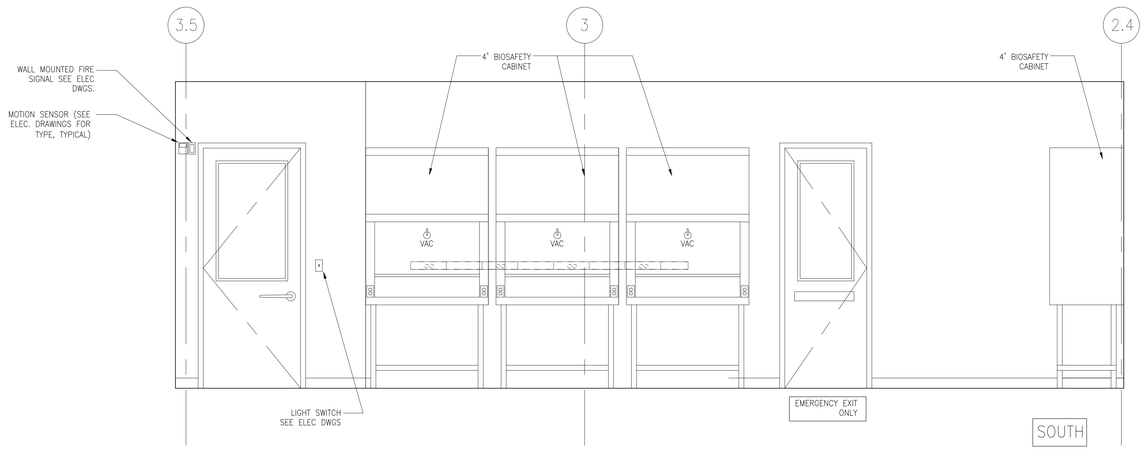

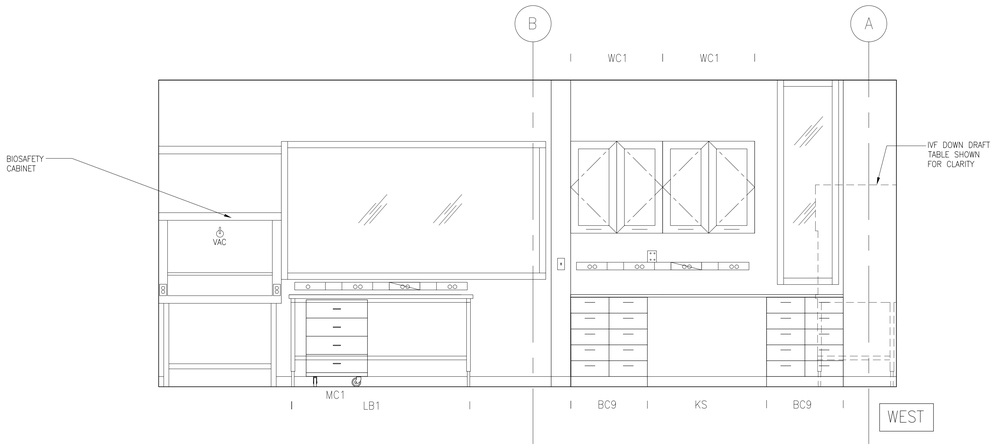

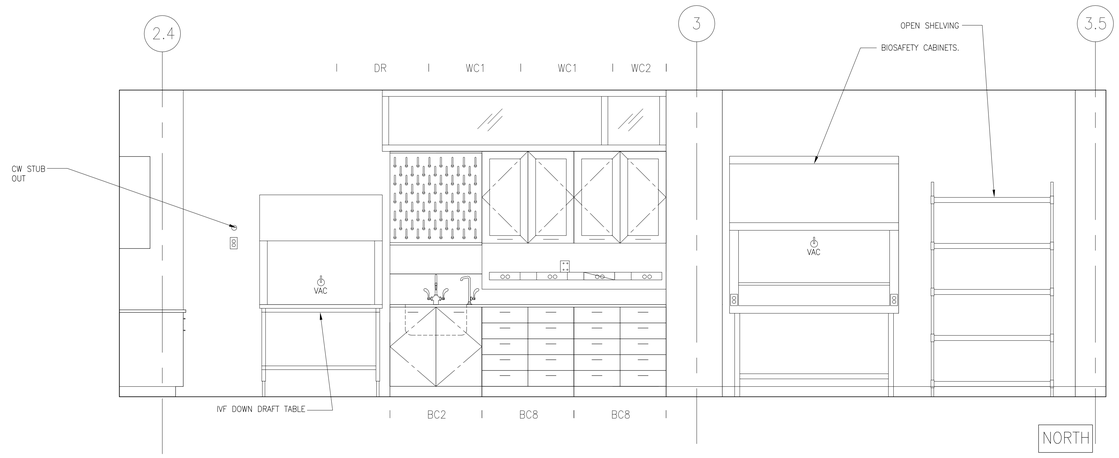

2 A4.06 **CIRM CELL CULTURE RM# 0465B**
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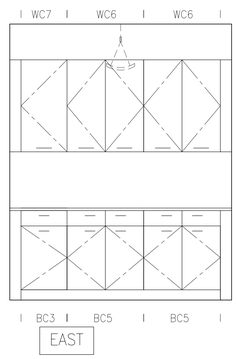

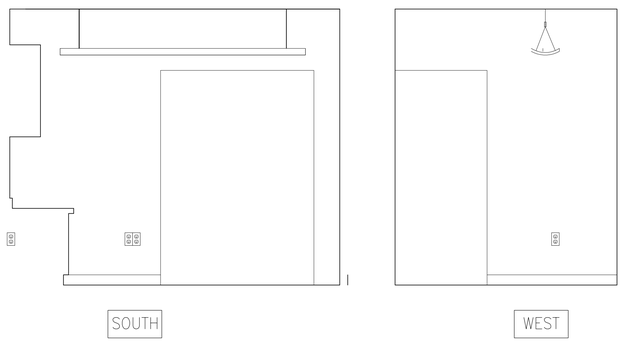

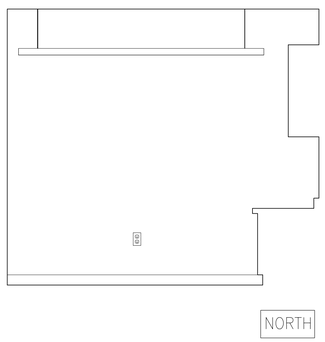

1 A4.06 **CIRM OFFICE SERVICE RM# 0401**
1/2"=1'-0"

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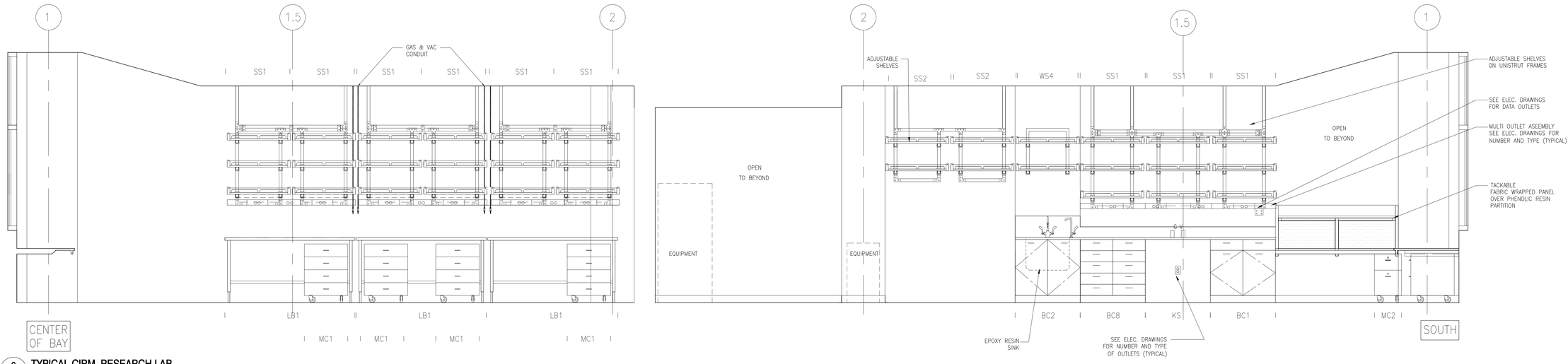
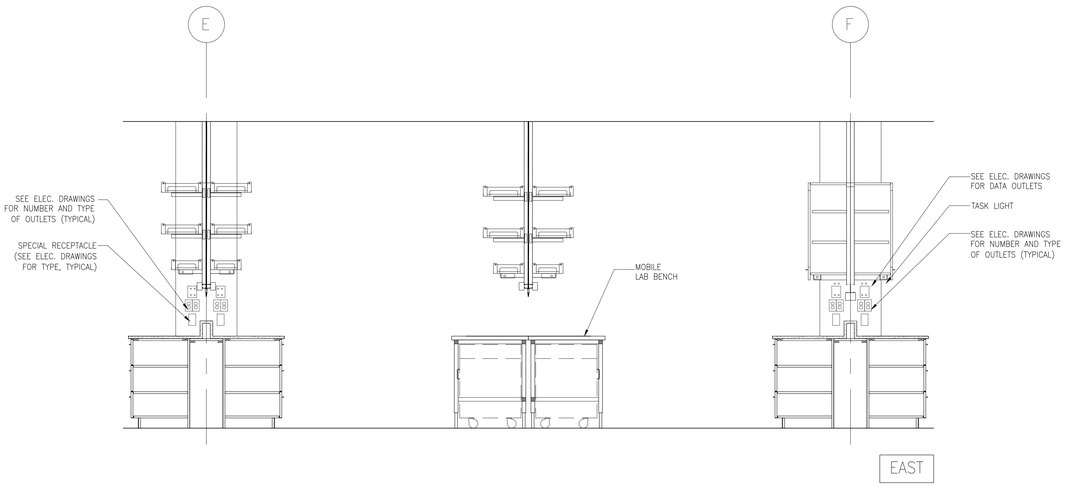
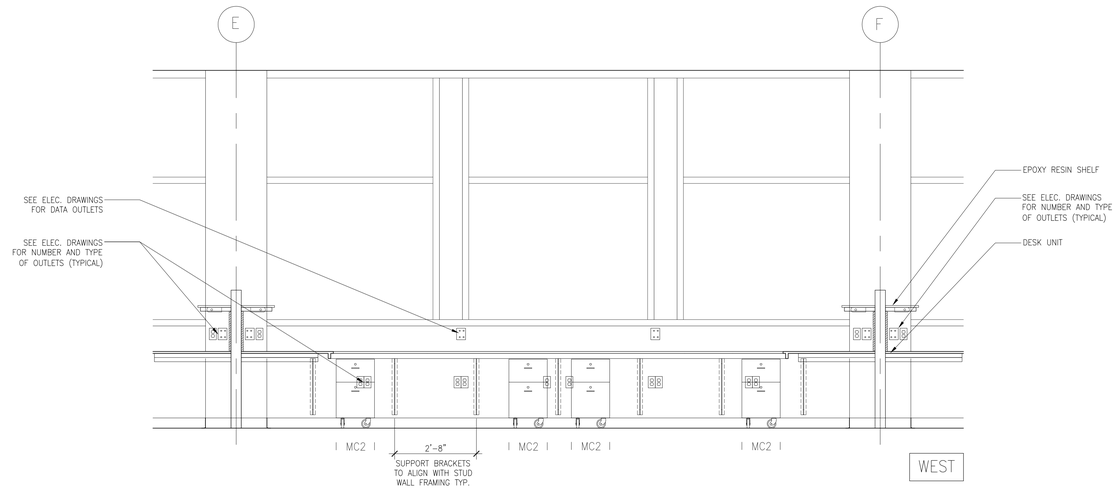
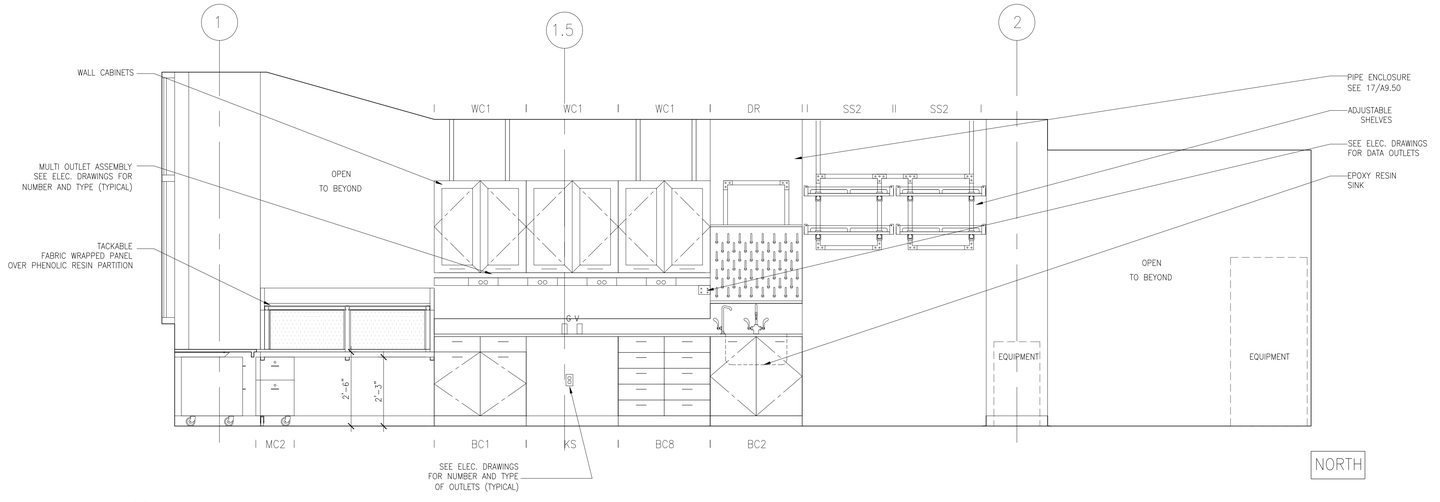


2 A4.07 **TYPICAL CIRM RESEARCH LAB**
1/2"=1'-0"







1 A4.07 **TYPICAL CIRM RESEARCH LAB**
1/2"=1'-0"

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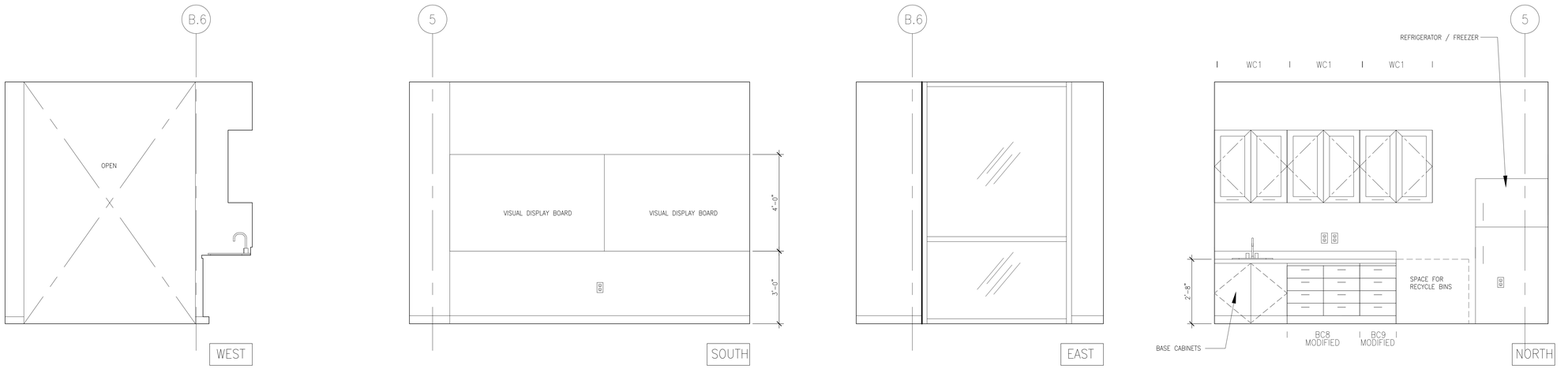

2 A4.08 **CIRM INTERACTIVE RM# 0454**
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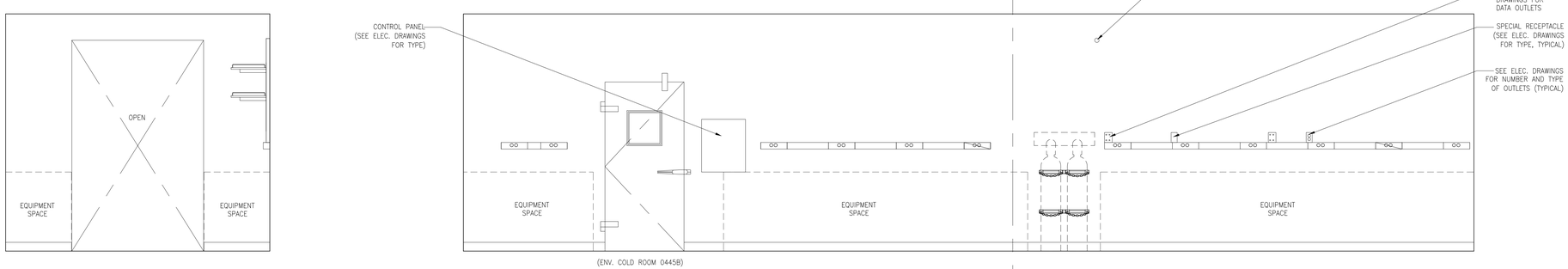

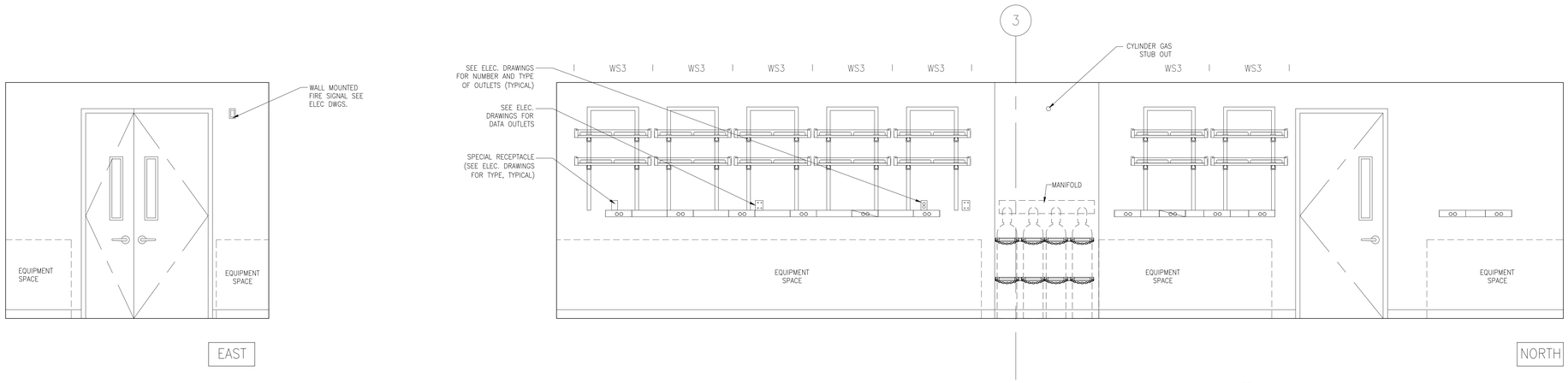

1 A4.08 **CIRM EQUIPMENT VESTIBULE 0445A**
1/2"=1'-0"

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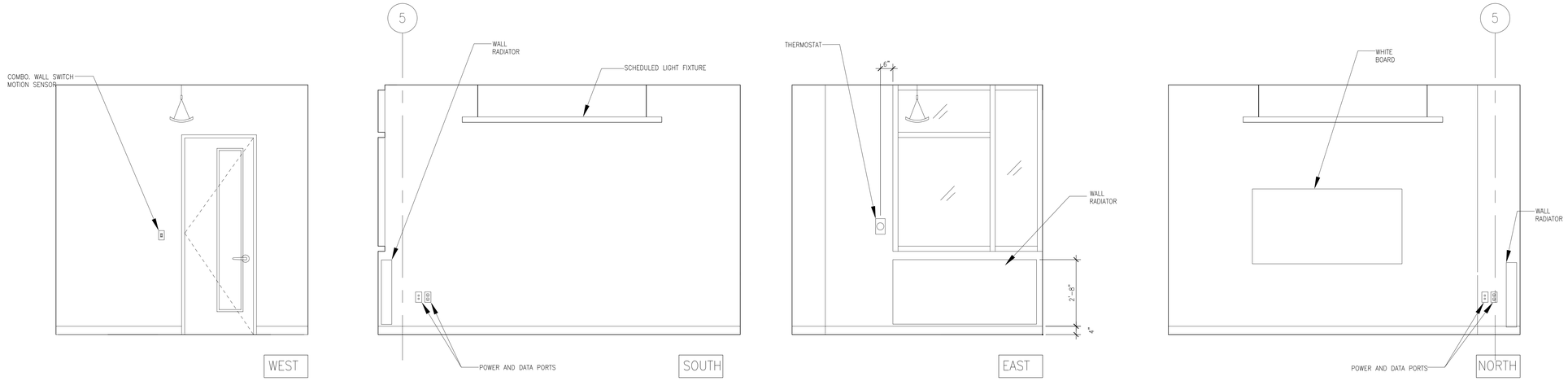

2 A4.09 **TYP CIRM FACULTY OFFICE**
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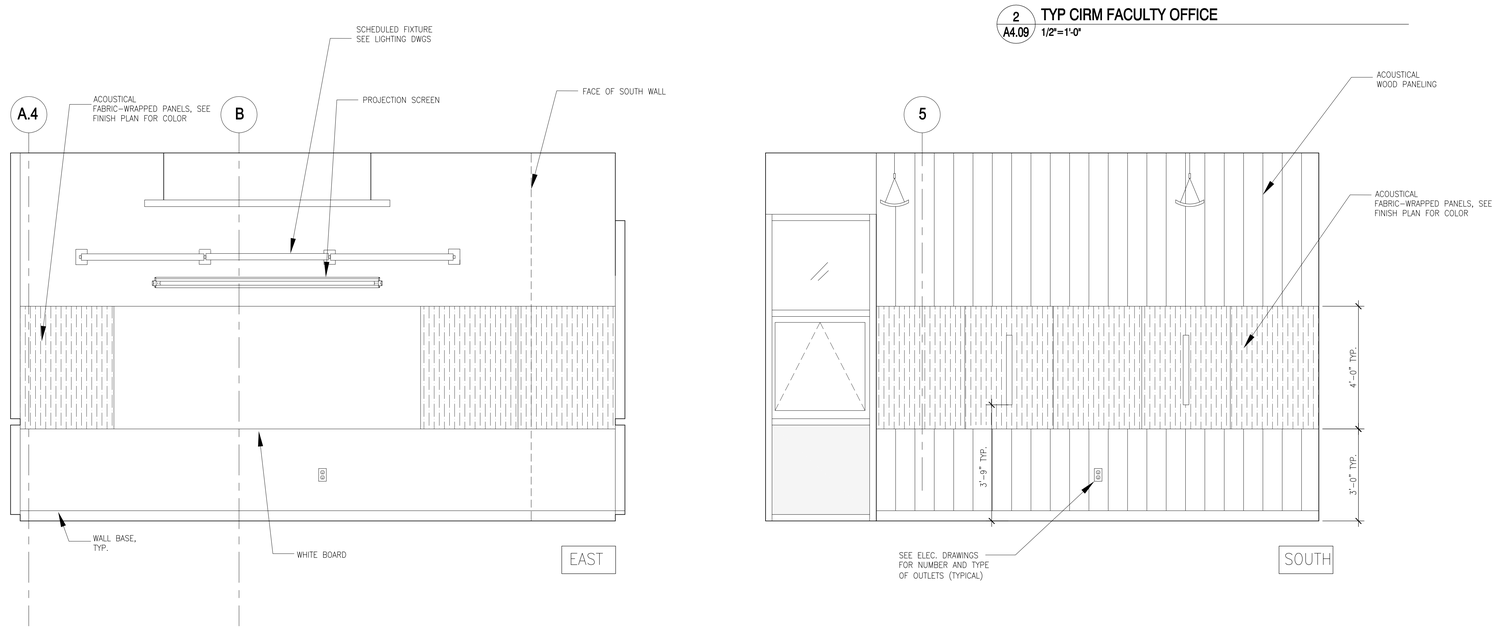

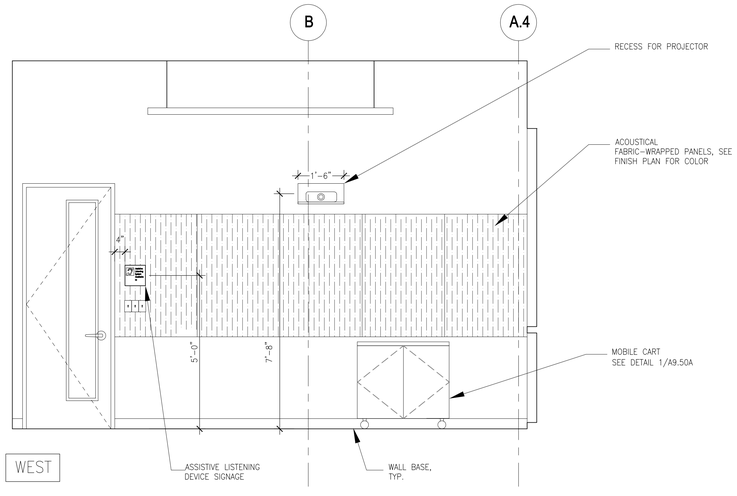

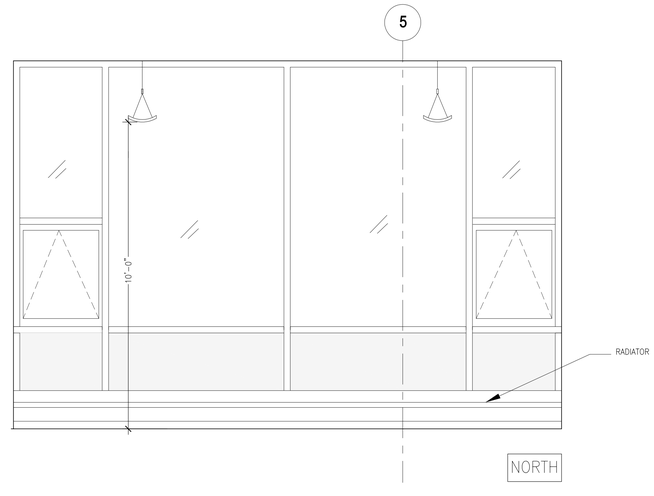

1 A4.09 **CIRM CONFERENCE RM#0460**
1/2"=1'-0"

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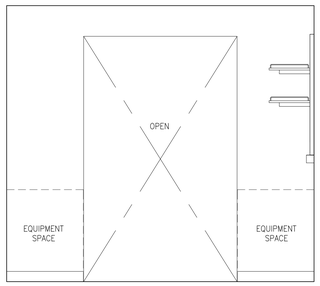

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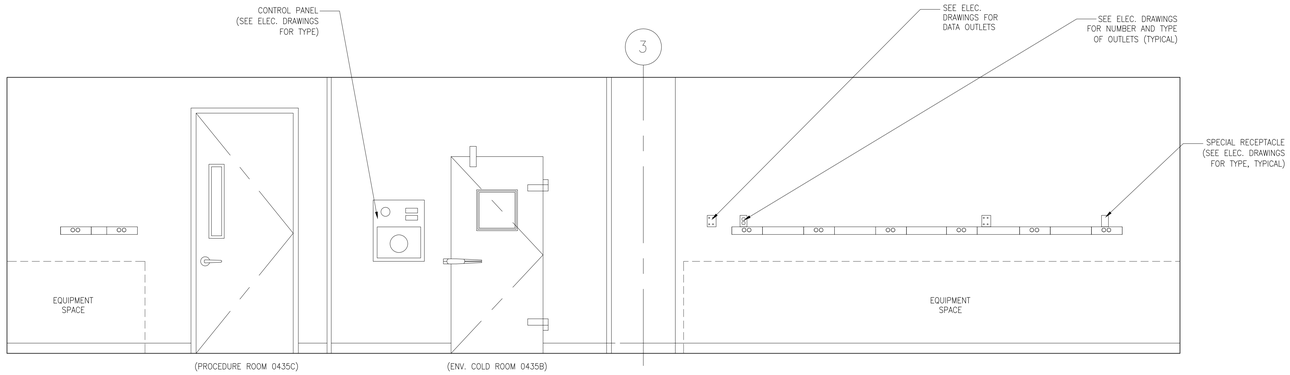

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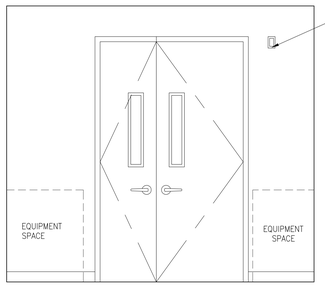

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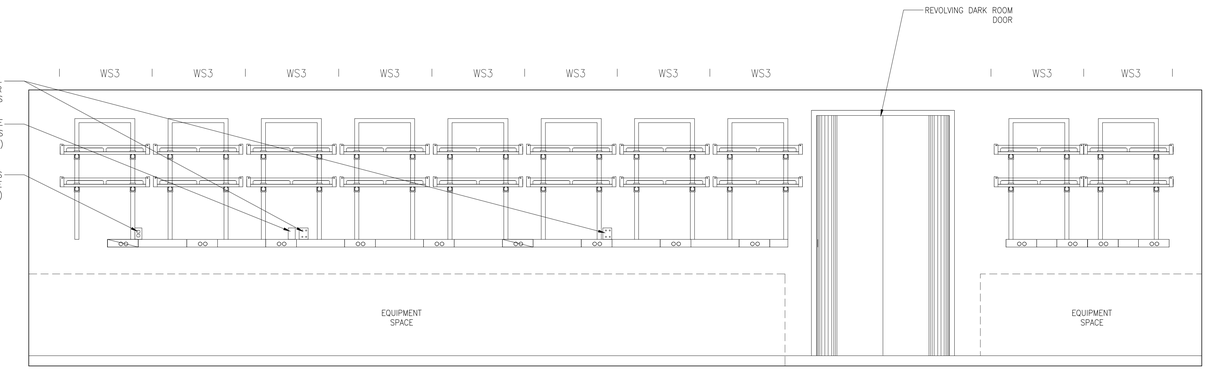

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2 A4.10 CIRM EQUIPMENT VESITBULE RM#0435A , 0415A
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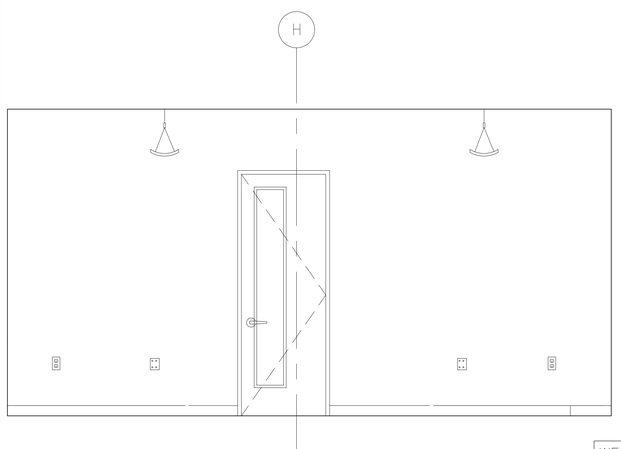

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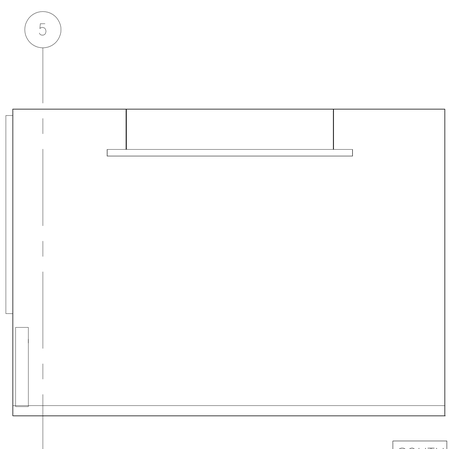

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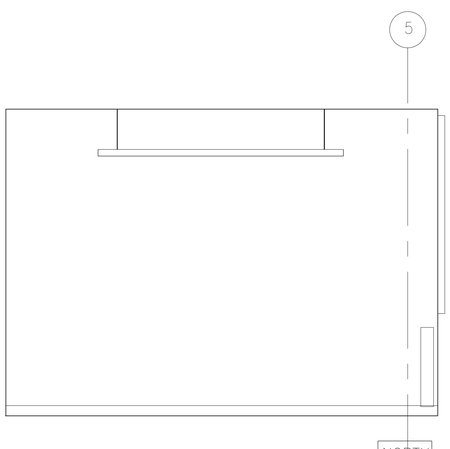

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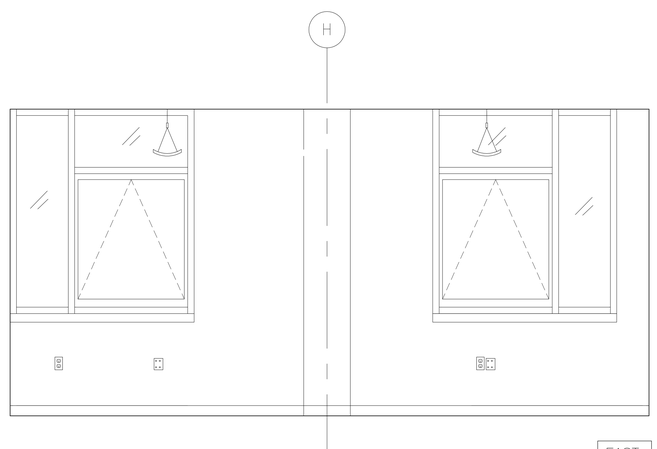

EAST

1 A4.10 CIRM POSTDOC OFFICE RM#0412
1/2"=1'-0"

Biomedical Sciences Facility CIRM Laboratory

University of California, Santa Cruz

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Printing	Date
GRANT SKETCH PLANS	FEB 20, 2008

Revisions	Date

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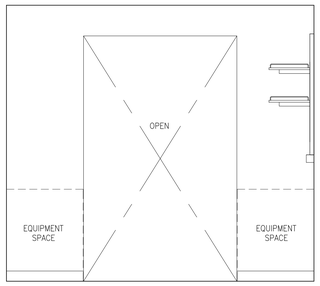
EHDD Job Number
06013
UCSC Job Number
6701
Sheet Title

CIRM LAB INTERIOR ELEVATIONS

Sheet Number
A4.10



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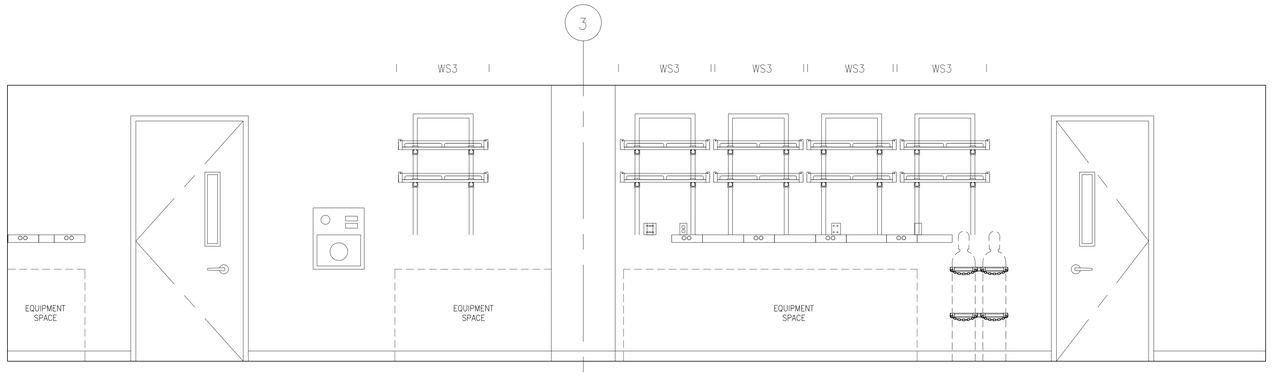

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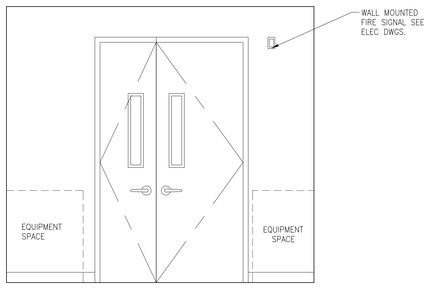

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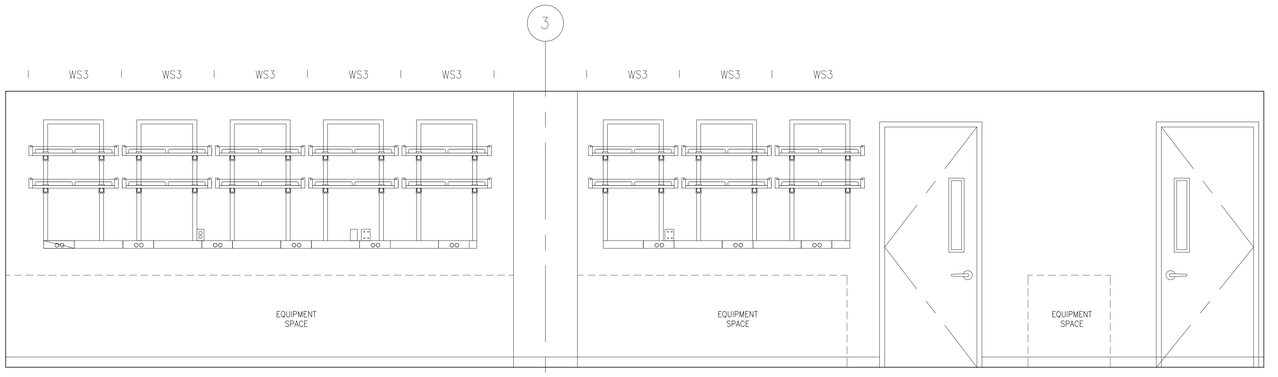

NORTH

1 A4.11 CIRM EQUIPMENT VESTIBULE RM#0415A
1/2"=1'-0"

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